By this Amendment, Applicant has added new claims 35-143. Thus, Claims 1-143 are now pending in the present application.

In view of the more than three independent claims and twenty total claims, Applicant is filing concurrently herewith an Excess Claim Fee Letter.

Applicant is also filing concurrently herewith a Petition For A One-Month Extension of Time, thereby extending the time for responding to the Office Action dated May 15, 1997 to September 15, 1997.

In the Office Action, claims 16 and 17 were objected to as being identical claims. By this Amendment, Applicant has amended claim 17 to depend on claim 2; claim 16 is dependent on claim 1. Since claims 16 and 17 are no longer identical claims, the Examiner is respectfully requested to withdraw the claim objection of record.

Claims 1, 14, 16-18, 20, 22-24, 26-30 and 33 were rejected under 35 USC § 102(e) as being anticipated by U.S. Patent No. 5,582,558 to Palmeri et al. Claims 6 and 8 were rejected under 35 USC § 103 as being unpatentable over Palmeri et al in view of Nellums et al. Claims 2-5, 7, 9-13, 15, 19, 21, 25, 31-32 and 34 were only objected to as being dependent upon a rejected base claim; the Examiner indicates that these objected claims would be

allowable if rewritten in independent form.

Applicant is also filing concurrently herewith First, Second, Third and Fourth Requests for Interferences for U.S. Patent Nos. 5,569,115 to Desautels et al; 5,571,059 to Desautels et al; 5,573,477 to Desautels et al and 5,582,558 to Palmeri et al. Regarding the Fourth Request for Interference for U.S. Patent No. 5,582,558 to Palmeri et al, Applicant has filed Declarations and documentary evidence establishing the date of invention of the present application to be prior to July 27, 1995 -- the filing date of the Palmeri et al patent. Accordingly, Applicant has established that the Palmeri et al patent is not prior art to the present application under 35 USC § 102(e). Since the § 102 and § 103 rejections of record are each based on the Palmeri et al patent, these prior art rejections should be withdrawn.

In view of the foregoing, it is respectfully submitted that claims 1-34 are in allowable condition. Regarding new claims 35-143, as set forth in the Requests For Interferences filed herewith, claims 35-143 were copied either substantially or identically from U.S. Patent Nos. 5,569,115 to Desautels et al; 5,571,059 to Desautels et al; 5,573,477 to Desautels et al and 5,582,558 to Palmeri et al and therefore claims 35-143 should also be allowed.

In view of the foregoing, it is respectfully submitted that claims 1-143 are in allowable condition.

REQUEST FOR PERSONAL INTERVIEW

The undersigned hereby requests a personal interview with the Examiner to discuss the present application. The Examiner is kindly requested to contact the undersigned at the telephone number listed below in order to schedule the personal interview.

Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee, except for the Issue Fee, for such extension is to be charged to Deposit Account No. 19-4880.

Respectfully submitted,

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Date: August 29, 1997

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

THOMAS A. GENISE

Application No: 08/666,164 — Group Art Unit: 3502

Filed: June 19, 1996 — Examiner: T. Kwon

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#13

For: AUTOMATED TRANSMISSION SYSTEM CONTROL WITH ZERO ENGINE FLYWHEEL TORQUE DETERMINATION

FIRST REQUEST FOR INTERFERENCE
PURSUANT TO 37 C.F.R. §§1.607 AND 1.608

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I. INTRODUCTION

Applicant hereby requests the declaration of an interference between this Application Serial No. 08/666,164 to Genise ("Genise '164 application") and U.S. Patent No. 5,573,477 to Desautels et al ("Desautels '477 patent"). This request for interference is made in accordance with the provisions of 37 CFR §§ 1.607 and 1.608, and as specified therein sets forth among other things: (1) Counts for the Interference; (2) a showing that the Desautels '477 patent contains claims that correspond to the Counts; (3) a showing that the Genise '164 application contains claims that correspond to the Counts; and (4) an explanation of Genise's right to priority, supported by Declarations and documentary evidence.

II. THE SUBJECT MATTER IN ISSUE

The subject matter of this potential interference is a

system for breaking torque between the engine and the transmission of a vehicle driveline. Torque is provided between the engine and the transmission when the clutch members of a particular gear in the transmission are engaged. By breaking this torque, the transmission can more easily be shifted into a neutral position in which the clutch members of the gear are no longer engaged. Such a break in torque between the engine and the transmission is often referred to as "zero flywheel torque". The present invention provides an engine control to control a parameter of the engine, such as engine fueling, and an operator input to allow an operator the ability to signal a desire to eliminate torque between the engine and the transmission. Specifically, the operator input requests the engine control to determine a zero torque engine fueling value, or other zero torque engine parameter value. In response to the operator's request, the engine control manipulates the engine fueling to achieve the zero torque engine fueling value, thereby breaking torque between the engine and the transmission, and allowing the transmission to be easily shifted into neutral.

III. THE INVOLVED PATENT AND APPLICATION

The application for U.S. Patent No. 5,573,477 ("the Desautels et al '477 patent") was filed on July 27, 1995 and the patent issued to Desautels et al on November 12, 1996.

The present application U.S. Appln. No. 08/666,164 to Thomas

A. Genise (The Genise '164 application) was filed on June 19, 1996. By the Amendment filed concurrently herewith, Applicant has amended the specification to indicate that the Genise '164 application is a continuation application of U.S. Appln. Nos. 08/649,830, 08/649,831 and 08/649,833, each filed April 30, 1996. Further, Applicant is adding new claims 35-78. These claims correspond to claims 1-15 and 17-20 of the Desautels et al '477 patent and to pending claims 1-2, 4, 6, 9, 11, 12, 13, 14, 15, 16, 19, 20, 22, 23-24, 26-29, 31-34 and 35 of U.S. Application No. 08/649,833. Applicant has not added claims 3, 7, 8, 10, 17, 18, 21, 25 and 30 of Application No. 08/649,833 as these claims relate to splitter shifts and therefore define a separate patentable invention.

IV. THE PROPOSED COUNTS FOR INTERFERENCE

In accordance with 37 CFR §1.607(a)(2), Applicant proposes Counts 1 and 2 set forth below. Claim 1 defines a vehicle drive, and Count 2 defines a method of operating a vehicle drive. The proposed Count 1 corresponds exactly to the Desautels '477 patent claim 1 and to Genise '164 application claim 35. The proposed Count 2 corresponds exactly to Desautels '477 patent claim 17 and to Genise '164 application claim 43.

COUNT 1

A vehicle drive comprising:

an engine having an output shaft;
a transmission selectively connected to said engine output shaft, said transmission having several selectively actuated speed ratios, said transmission having a transmission output shaft, said selected speed ratios controlling the ratio of the input speed from said engine output shaft to the output speed of said
transmission output shaft; and

an engine control to control a parameter of said engine, said engine control including an operator input to allow an operator to signal a desire to eliminate torque between said engine output shaft and said transmission output shaft, said operator signal requesting said engine control to determine a zero torque parameter value for said engine output shaft that approximates a zero torque load on the connection between said engine and said transmission, and said engine control being operable to control said engine to achieve said zero torque parameter value.

<u>COUNT 2</u>

A method of operating a vehicle drive comprising the steps of:

a. providing an engine, an engine parameter control, a multi-speed transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, a manual stick shift for changing speed ratios in said transmission;

b. predicting a zero torque parameter value for said engine based on system variables;

c.modifying said engine parameter by said engine control to achieve said zero torque value; and

d.manually moving said transmission out of

engagement to a neutral position

V. DESIGNATION OF CLAIMS CORRESPONDING TO THE COUNTS

1. Identification of Claims In The Desautels et al '477 Patent Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(3), Applicant identifies apparatus claims 1-10 of the Desautels et al '477 patent as corresponding to proposed Count 1. The proposed Count 1 is claim 1 of the Desautels et al '477 patent. All of the claims 1-10 of the Desautels et al '477 patent are proposed to correspond to Count 1 because they all define the same patentable invention.

Applicant identifies method claims 11-20 as corresponding to proposed Count 2. The proposed Count 2 is claim 17 of the Desautels et al '477 patent. All of the claims 11-20 of the Desautels et al '477 patent are proposed to correspond to Count 2 because they all define the same patentable invention.

2. Offer of Claims In This Application Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(4), Applicant submits that apparatus claims 24-42 and 51-52, 54-78 of the Genise '164 application correspond to proposed Count 1, and that method claims 1-23, 43-50 and 53 of the Genise '164 application correspond to proposed Count 2. As noted above, the added claims 54-78 correspond to pending claims 1, 2, 4, 6, 9, 11-16, 19-20,

22-24, 26-29 and 31-35 of U.S. Appln. No. 08/649,833 and will be cancelled therefrom. The remaining claims of Appln. No. 08/649,833 recite the feature of splitter shifting and therefore define a patentably distinct invention from proposed counts 1 and 2. Accordingly, these remaining claims have not been added.

VI. SUPPORT FOR CLAIMS 35-78 OF THE GENISE '164 APPLICATION

In the Table below Applicant has applied each of the new claims 35-78 to the specification pursuant to 37 CFR §1.607(1)(5)(ii).

New Claims 35-78	**Specification of U.S. Appln. No. 08/666,164**
35. A vehicle drive comprising:	Fig. 3 shows a vehicle drive
an engine having an output shaft;	Engine 102 includes an output shaft (Fig. 3)
a transmission selectively connected to said engine output shaft, said transmission having several selectively actuated speed ratios, said transmission having a transmission output shaft, said selected speed ratios controlling the ratio of the input speed from said engine output shaft to the output speed of said transmission output shaft; and	Transmission 10 is selectively connected to engine output shaft via master clutch 104 (Fig. 3). Transmission 10 has several different speed ratios (page 5, ln. 7; page 6, ln. 11). Transmission 10 has an output shaft 58. Aux. transmission section 14 of transmission 10 provide selectable speed ratios between the input (main shaft 46) and output 58 (Figs. 1-2). Shaft 18 is coupled to the crank shaft of the engine 102.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
an engine control to control a parameter of said engine, said engine control including an operator input to allow an operator to signal a desire to eliminate torque between said engine output shaft and said transmission output shaft, said operator signal requesting said engine control to determine a zero torque parameter value for said engine output shaft that approximates a zero torque load on the connection between said engine and said transmission, and said engine control being operable to control said engine to achieve said zero torque parameter value.	Engine control unit 112 (Fig. 3), 146 controls engine 102. The engine control unit 112, 146 receives an operator input (intent-to-shift) signal from button 120 which allows an operator to signal a desire to relieve torque lock (page 12, lns. 13-23). Upon receiving intent-to-shift (ITS) signal, controller 146 issues commands to engine controller 112 to approximate zero torque load thereby relieving torque lock by fuel manipulations (pg. 12, lns. 25-28). Gross engine torque required for zero flywheel torque is represented by the equation on page 14, line 11.
36. A vehicle drive as recited in claim 35, wherein said engine parameter is the amount of fuel delivered to said engine.	Torque lock is relieved by throttle manipulations (page 12, lns. 15-18).
37. A vehicle drive as recited in claim 35, wherein said zero torque parameter value is a predicted value based at least in part on a sensed engine speed.	Engine torque is based on the torque to accelerate the engine T_{ACCEL} which is a function of the rate of change of engine speed dES/dt. (page 14, lines 11-24).
38. A vehicle drive as recited in claim 37, wherein said control is operable to vary said engine parameter above and below said predicted zero torque value as a function of time.	Upon commanding a shift into neutral, the engine is commanded to dither to values greater than and less than zero torque T_{EG} (page 16, lines 23-26).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
39. A vehicle drive as recited in claim 38, wherein said engine parameter is controlled to move above and below said predicted value with a saw tooth profile.	A saw tooth profile is provided for the zero torque value by dithering above and below the zero torque value (page 16, lns. 23-27).
40. A vehicle drive as recited in claim 35, wherein said engine control also controls the speed of said engine after said transmission has been moved to a neutral position by predicting a synchronizing speed for said engine output shaft at the next speed ratio for said transmission, and said engine control being operable to change said engine speed to achieve said synchronizing speed.	Controller 146 issues commands to the engine controller to cause the engine and input shaft speeds to approach the synchronous values, and upon confirmation of the synchronous condition, the operator shifts into the targeted gear (page 10, lns. 20-26; page 11, ln. 1 through page 12, ln. 12).
41. A vehicle drive as recited in claim 35, wherein a manual stick shift allows an operator to manually shift said transmission speed ratios.	Fig. 3 shows a manual stick shift 57 for allowing an operator to manually shift the transmission.
42. A vehicle drive as recited in claim 41, wherein a selectively actuated clutch is disposed between said transmission and said engine output shaft.	Clutch 104 is disposed between transmission 10 and engine 102 (Fig. 3).
43. A method of operating a vehicle drive comprising the steps of:	Fig. 3 shows a vehicle drive operation.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
a. providing an engine, an engine fuel control, a transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, and an operator input switch to indicate a desire to eliminate torque on said transmission and allow the operator to move said transmission to begin a speed ratio shift;	Fig. 3 shows an engine 102, an engine fuel control 112, 148, and a transmission 10 driven by an engine output shaft. Transmission 10 has several selectively actuated speed ratios (page 5, ln. 7 - pg. 6, ln. 5). Shift lever 57 includes an intent to shift button/switch which senses a driver's desire to shift to neutral and relieve torque lock (page 12, lines 13-23).
b. indicating a desire to eliminate torque by actuating said input switch;	When switch 120 is actuated, torque lock is relieved (page 12, lns. 15-17).
c. determining a zero torque fuel to reduce the torque load between said engine and said transmission;	Controller 146 will issue commands to engine controller 112 to relieve engine torque lock (page 12, lns. 15-16). Zero torque is determined (pg. 12, lns. 25-28 and pg. 14, lns. 7-24).
d. modifying said engine fueling by said controller to achieve said zero torque fuel value; and	Controller 146 issues commands to relieve torque lock by fuel manipulations (page 12, lns. 15-17).
e. manually moving said transmission out of engagement to a neutral position.	After torque lock is relieved, the operator can easily shift stick shift lever 57 into the neutral position (page 12, lns. 18-20).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
44. A method as recited in claim 43, including the further steps of predicting the next selected gear ratio after said transmission has been moved to neutral, predicting a synchronizing speed for said engine output shaft at said next selected gear ratio, and using said engine control to begin moving said engine speed towards said synchronizing speed.	The system informs the operator of when the engine speed is at or approaching a synchronous speed sufficient to allow the shift lever to be moved into the target lever position. Fig. 4 shows predicting sync. speed for the next selected gear ratio (page 11, lns. 13-25; page 12, lns. 4-12).
45. A method as recited in claim 43, wherein said zero torque fuel value is predicted based upon certain system conditions.	The zero torque value is predicted based upon system conditions (page 2, lns. 11-26 and page 14, ln. 7 to page 15, ln. 4).
46. A method as recited in claim 45, wherein said engine fueling is adjusted above and below said predicted value as a function of time.	Engine fuel is adjusted above and below the predicted zero torque value as a function of time (page 16, lns. 23-26).
47. A method as recited in claim 45, wherein said zero torque value is predicted based upon engine speed.	Engine torque is based on the torque to accelerate the engine T_{ACCEL} which is a function of the rate of change of engine speed dES/dt (page 14, lns. 11-24).
48. A method of operating a vehicle drive comprising the steps of:	Fig. 3 shows a vehicle drive operation. Figs. 5A-5D show a method of operating same.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
a. providing an engine, an engine parameter control, a multi-speed transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, a manual stick shift for changing speed ratios in said transmission;	Fig. 3 shows an engine 102, an engine parameter control 112, 148, and a multi-speed transmission 10 driven by engine 102 output shaft. Transmission 10 includes several speed ratios, and a shift lever 57 is used for changing speed ratios in the transmission 10 (page 5, lns. 7-28).
b. predicting a zero torque parameter value for said engine based on system variables;	A zero torque parameter value is predicted for the engine based on system variables (page 2, lns. 11-26 and page 14, ln. 7 through page 15, ln. 4).
c. modifying said engine parameter by said engine control to achieve said zero torque value; and	Controller 146 issues commands to engine controller to relieve torque lock by fuel manipulations (page 12, lns. 15-17).
d. manually moving said transmission out of engagement to a neutral position.	After torque lock is relieved, the operator can easily shift into neutral, (page 12, lns. 18-20).
49. A method as recited in claim 48, wherein said predicted value is based at least in part on engine speed.	Engine torque is based on the torque to accelerate the engine T_{ACCEL} which is a function of the rate of change of engine speed dES/dt (page 14, lns. 11-24).
50. A method as recited in claim 48, wherein said engine parameter is adjusted above and below said zero torque value as a function of time.	Upon commanding a shift into neutral, the engine 102 is commanded to dither to values greater than and less than zero torque T_{EG} (page 16, lines 23-26).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
51. A vehicle drive as recited in claim 37, wherein said predicted value includes a component calculated based upon an acceleration value for the transmission output shaft.	T_{ACCEL} at page 2, lines 22-24 is a function of vehicle acceleration dos/at.
52. A vehicle drive as recited in claim 51, wherein the predicted zero torque parameter includes a component based upon oil temperature of the engine.	T_{BEF} at page 2, lines 19-22 is a function of oil temperature.
53. A method as recited in claim 48, wherein said zero torque parameter is predicted based upon the acceleration of the transmission output speed.	T_{ACCEL} at page 2, lines 22-24 is a function of vehicle acceleration dos/at.
54. A vehicular semi-automated shift implementation system comprising:	Fig. 3 shows a vehicular semi-automated shift implementation system.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a shift pattern;	Transmission 10 is manually shifted, includes an input shaft driven by engine 102, and output shaft and several jaw clutches for allowing selection of different drive ratios and neutral (Figs. 1 and 3). The jaw clutches are selectively positioned by manual shift lever 57 having several selectable positions 126, 128, 130, 132, 134 and 136 (Fig. 3).
means to sense conditions indicative of an operator intention to shift said transmission into neutral and effective, upon sensing conditions indicative to an operator intention to shift into neutral, to automatically cause said engine to be fueled to minimize torque transfer between said input shaft and said output shaft.	The controller 146 senses operator's intention to shift into neutral, and upon sensing same, automatically controls engine fueling to minimize torque transfer between input and output shafts (page 12, lines 13-28).
55. The system of claim 54 wherein said jaw clutches are non-synchronized jaw clutches.	Clutch collars 48 and 50 are non-synchronized jaw clutches (page 5, lines 26-28).
56. The system of claim 54 wherein said conditions comprise operator manipulation of the shift lever.	Intent-to-shift button 120 (Fig. 3) is operated by the driver.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
57. The system of claim 54 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.	When neutral is confirmed, the engine controller causes engine to approach sync. speed (i.e., terminates fueling for zero torque transfer) (page 12, lines 4-9).
58. A vehicular semi-automated shift implementation system comprising:	Fig. 3 shows a vehicular semi-automated shift implementation system.
a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a shift pattern;	Transmission 10 is manually shifted, includes an input shaft driven by engine 102, and several jaw clutches for allowing selection of different drive ratios and neutral (Figs. 1 and 3). The jaw clutches are selectively positioned by manual shift lever 57 having several positions 126, 128, 130, 132, 134 and 136 (Fig. 3).
an engine controller effective to fuel said engine in accordance with command output signals;	Engine control unit 112, 146 (Fig. 3) controls the fueling to engine 102 in accordance with commands.
an operator-actuated intent-to-shift switch for providing an intent-to-shift signal indicative of operator intent to shift into neutral; and	Operator-actuated intent-to-shift switch 120 allows operator to indicate a desire to shift to neutral.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
a controller for receiving input signals including said intent-to-shift signals and for processing same according to predetermined logic rules to issue command output signals to system actuators including said engine controller.	Controller 146 receives input signals including intent-to-shift signal and processes same to issue commands to system actuator including engine controller 112.
59. The system of claim 58 wherein said logic rules include rules for causing said engine to be fueled to minimize torque transfer between said input and output shafts upon sensing operator actuation of said intent-to-shift switch.	The flow chart of, for example, Fig. 5A shows the logic rules for causing "fuel to break torque" upon sensing actuation of intent-to-shift switch 120.
60. The system of claim 58 wherein said jaw clutches are non-synchronized jaw clutches.	Jaws 48 and 50 are non-synchronized (page 5, lines 26-28).
61. The system of claim 59 wherein said jaw clutches are non-synchronized jaw clutches.	Jaws 48 and 50 are non-synchronized (page 5, lines 26-28).
62. The system of claim 59 further comprising sensors for providing input signals indicative of the engaged and neutral condition of said transmission, said logic rules including rules for determining if the transmission is in neutral and for causing engine fueling to minimize torque transfer between said input and output shafts only if said transmission is not in neutral.	The sensor 114 provides a signal CL indicative of clutch-engaged or disengaged (neutral). Fig. 5A shows that the fuel to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not neutral).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
63. The system of claim 61 further comprising sensors for providing input signals indicative of the engaged and neutral condition of said transmission, said logic rules including rules for determining if the transmission is in neutral and for causing engine fueling to minimize torque transfer between said input and output shafts only if said transmission is not in neutral.	The sensor 114 provides a signal CL indicative of clutch-engaged or disengaged (neutral). Fig. 5A shows that the fuel to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not neutral).
64. The system of claim 58 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.	Intent-to-shift button or switch 120 is located on the shift knob and is normally biased to a non-activated position (page 12, lines 13-18).
65. The system of claim 59 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.	Intent-to-shift button or switch 120 is located on the shift knob and is normally biased to a non-activated position (page 12, lines 13-18).
66. The system of claim 61 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.	Intent-to-shift button or switch 120 is located on the shift knob and is normally biased to a non-activated position (page 12, lines 13-18).
67. The system of claim 62 wherein said switch is a button resiliently biased to a non-activated position and located on said shift lever.	Intent-to-shift button or switch 120 is located on the shift knob and is normally biased to a non-activated position (page 12, lines 13-18).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
68. The system of claim 58 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.	Fig. 3 shows engine 102 drivingly connected to the input shaft of transmission 12 by a manually controlled friction clutch 104. The system includes sensors 106 for determining engaged/disengaged conditions of the master clutch 104 (page 9, lines 7-21). Fig. 5A shows that fueling to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not in neutral).
69. The system of claim 59 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.	Fig. 3 shows engine 102 drivingly connected to the input shaft of transmission 12 by a manually controlled friction clutch 104. The system includes sensors 106 for determining engaged/disengaged conditions of the master clutch 104 (page 9, lines 7-21). Fig. 5A shows that fueling to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not in neutral).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
70. The system of claim 61 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.	Fig. 3 shows engine 102 drivingly connected to the input shaft of transmission 12 by a manually controlled friction clutch 104. The system includes sensors 106 for determining engaged/disengaged conditions of the master clutch 104 (page 9, lines 7-21). Fig. 5A shows that fueling to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not in neutral).
71. The system of claim 62 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.	Fig. 3 shows engine 102 drivingly connected to the input shaft of transmission 12 by a manually controlled friction clutch 104. The system includes sensors 106 for determining engaged/disengaged conditions of the master clutch 104 (page 9, lines 7-21). Fig. 5A shows that fueling to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not in neutral).

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
72. The system of claim 64 wherein said engine is drivingly connected to said input shaft by a manually controlled friction clutch, further comprising sensors providing input signals indicative of the engaged and disengaged conditions of said friction clutch, and said logic rules include rules for determining the engaged and disengaged conditions of said friction clutch and causing said engine to be fueled in accordance with operator demand upon sensing disengagement of said friction clutch.	Fig. 3 shows engine 102 drivingly connected to the input shaft of transmission 12 by a manually controlled friction clutch 104. The system includes sensors 106 for determining engaged/disengaged conditions of the master clutch 104 (page 9, lines 7-21). Fig. 5A shows that fueling to break torque logic rule will not be performed unless GR (gear) is engaged (i.e., not in neutral).
73. The control system of claim 58 further comprising a microprocessor-based computer mounted to said engine and having a memory, said logic rules stored in said memory.	Engine controller 112 is a microprocessor-based computer and is mounted to the engine 102 (Fig. 3; page 10, lines 3-9).
74. The control system of claim 59 further comprising a microprocessor-based computer mounted to said engine and having a memory, said logic rules stored in said memory.	Engine controller 112 is a microprocessor-based computer and is mounted to the engine 102 (Fig. 3; page 10, lines 3-9).
75. A vehicular semi-automated shift implementation system comprising:	Fig. 3 shows a vehicular semi-automated shift implementation system.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
a manually shifted transmission having an input shaft driven by a fuel-controlled engine, an output shaft and a plurality of selectably engageable and disengageable jaw clutches allowing selection of a plurality of drive ratios and neutral, said jaw clutches selectively positioned by a manually operated shift lever having a plurality of selectable shift lever positions defining a shift pattern;	Transmission 10 is manually shifted, includes an input shaft driven by engine 102, an output shaft, and several jaw clutches for allowing selection of different drive ratios and neutral. The jaw clutches are selectively positioned by manual shift lever 57 having several selectable positions 126, 128, 130, 132, 134, 136 (Fig. 3).
a manually operated intent-to-shift switch by which an operator can signal an intention to manually shift the transmission;	The intent-to-shift switch 120 (Fig. 3).
means to sense operation of said intent-to-shift switch and effective, upon sensing operation of said intent-to-shift switch, to automatically cause said engine to be fueled to minimize torque transfer between said input shaft and said output shaft.	The controller 146 senses operation of the intent-to-shift button 120 and automatically fuels the engine to minimize torque transfer between the input and output shafts (page 12, lines 12-24).
76. The system of claim 75 wherein said switch comprises a manually operated button located on said shift lever.	Intent-to-shift button 120 is located on shift knob 118.

New Claims 35-78	Specification of U.S. Appln. No. 08/666,164
77. The system of claim 75 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.	When neutral is confirmed, the engine controller causes engine to approach sync. speed (i.e., terminates fueling for zero torque transfer) (page 12, lines 4-9).
78. The system of claim 76 further comprising means for sensing transmission neutral and upon sensing transmission neutral, terminating fueling of the engine to minimize torque transfer between said input shaft and said output shaft.	When neutral is confirmed, the engine controller causes engine to approach sync. speed (i.e., terminates fueling for zero torque transfer) (page 12, lines 4-9).

VII. 37 CFR §1.608 SHOWING

Since the filing date of the Genise '164 application is more than three months after the filing date of the Desautels et al '477 patent, Genise's burden is to establish <u>prima facie</u> entitlement to priority relative to the Desautels et al '477 patent's filing date of July 27, 1995. 37 CFR §1.608(b).

VIII. SUMMARY OF GENISE'S POSITION

In support of his showing of priority, Genise submits herewith Affidavits of Thomas A. Genise, Ronald K. Markyvech, James L. McReynolds, Warren R. Dedow, John Dresden III, Jon Steeby, and Steve Edelen together with contemporaneous

documentary exhibits. This evidence shows the following:

1. Since 1982 Thomas Genise has been an engineer at Eaton Corporation's Corporate Research & Development Center in Detroit, Michigan (CORD-DC) in the automated transmission development program for heavy duty vehicles. Since 1990 James McReynolds has worked for Eaton Corp. as head of Product Planning and Strategic Planning for North America.

2. Between 1994 and 1996 the automated transmission development program of Eaton Corporation in which Genise worked include related automated transmission projects under the names "AutoShift", "AutoSplit" and "Top Two". These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. These projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. The genesis of this technology is discussed below.

3. In early 1993, McReynolds conceived of a partially automated transmission system which would be easier to drive than a manual transmission system, but would be comparable in price to

a manual transmission. In August 1994, McReynolds contacted Genise and explained the partially automated system for purposes of having Genise develop the system.

4. By August 1994, with the assistance of Ronald Markyvech and John Dresden III, Thomas Genise designed, developed, built and tested the AutoSplit partially-automated multi-speed transmission system which included the torque breaking system of the Counts. The AutoSplit transmission was implemented in a Freightliner truck having a ten speed transmission.

5. The Freightliner truck having the ten speed AutoSplit transmission included the subject matter defined in Counts 1 and 2, and successfully completed a three day road test between August 29-31, 1994. Thomas Genise, Ronald Markyvech and John Dresden all participated in the August 29-31, 1994 road trip.

6. The Freightliner truck having the ten speed AutoSplit transmission was successfully demonstrated at Eaton Corporation's proving grounds in Marshall, Michigan, on January 11, 1995. Eaton engineers John Steeby and Warren Dedow who were familiar with the AutoSplit transmission including its software code structure, attended the demonstrations and actually drove the Freightliner truck.

7. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Truck Transmission Concept Prototype. This Technical Report, which described the

invention defined in Counts 1 and 2, was widely distributed to Eaton engineers and members of Eaton's upper management.

8. On July 14, 1995, Eaton Corporation held an "Automation Strategic Planning Meeting" at Eaton's Proving Grounds in Marshall, Michigan. At this meeting trucks with automated transmissions including the AutoSplit, AutoShift and Top Two transmissions were demonstrated to several Eaton engineers and members of upper management. Thomas Genise successfully demonstrated the Freightliner truck having the ten speed AutoSplit transmission at the July 14, 1995 Meeting. As part of these demonstrations, the attenders were given rides on the Freightliner truck and also were able to actually drive the truck.

9. From prior to July 27, 1995 to the filing date of the Genise '164 application on June 19, 1996, Thomas Genise continuously worked on development of Eaton's AutoSplit/AutoShift/Top Two automated transmission systems. This work included supervising software engineer Ronald Markyvech and mechanical technician John Dresden III.

10. The Genise '164 patent application was filed on June 19, 1996.

As discussed below, the Genise proofs demonstrate that Genise is <u>prima facie</u> entitled to priority relative to the Desautels et al '477 patent filing date of July 27, 1995 based

on:

1. Actual reduction to practice in August, 1994, January, 1995 and July, 1995; and
2. Conception plus diligence from prior to July 27, 1995 to a constructive reduction to practice on June 19, 1996.

IX. STATEMENT OF FACTS

1. Since January of 1982, Thomas Genise has worked as an engineer for Eaton Corporation in the Corporate Research and Development - Detroit Center (CORD-DC) in the automated transmission development program for heavy duty vehicles. (Genise Affd. ¶3).

Since July 1976, Ron Markyvech has worked as an engineer for Eaton Corp. at CORD-DC in the automated transmission development program for heavy duty vehicles. (Markyvech Affd. ¶3).

Since 1990 James McReynolds has worked for Eaton Corporation at TACONA as the head of Product Planning and Strategic Planning for North America. (McReynolds Affd. ¶3).

2. In early 1993, McReynolds conceived of a partially-automated transmission system which would be easier to drive than a manual transmission system, but which would be considerably less expensive than a fully automatic transmission system which does not contain a shift lever. (McReynolds Affd. ¶4). In conceiving the transmission system McReynolds realized that

considerable expense is associated with eliminating the shift lever of a transmission system. McReynolds conceived of a partially automated transmission system which maintains the shift lever - thereby reducing the cost of the system - but which allows the driver to shift gears without disengaging the master clutch and without manipulating the throttle pedal. (McReynolds Affd. ¶4-5). On August 11, 1993, McReynolds faxed a specification-type document (Exhibit A) to Eaton's patent counsel, Howard D. Gordon. Exhibit A describes a partially automated transmission system which provides clutchless and throttleless shifting with a shift lever. The shift lever includes a switch at the top of the knob which when depressed causes the engine fueling to be controlled so as to minimize torque between the engine and the transmission thereby allowing the operator to shift into neutral. Thereafter, the system controlled the engine to achieve the synchronization speed of the next gear, allowing the operator to easily shift into the next gear.

3. Sometime in August 1993, McReynolds called Tom Genise to discuss the possibility of Genise developing the partially automated transmission system which McReynolds named "AutoStick". (McReynolds Affd. ¶7). Specifically, McReynolds explained to Genise that the "AutoStick" transmission would include a shift lever, a shift button which the driver would depress in order to

upshift or downshift. In response to depressing the button, the system would automatically control engine fueling to minimize torque, thereby allowing the driver to move the shift lever to neutral without using the clutch pedal, and after sensing neutral, the system would automatically control engine fueling to approach the synchronization speed for the next gear, thereby allowing the driver to move the shift lever to the next gear without manipulating the throttle. (McReynolds Affd. ¶8-9). On September 7, 1993, McReynolds faxed the specification-type document (Exhibit B) to Genise. (Genise Affd. ¶8).

4. Genise renamed AutoStick as "AutoSplit", and on November 15, 1993, Genise sketched on an electronic white board three options of how AutoSplit could be implemented during a meeting at CORD-DC (Genise Affd. ¶9). Exhibit C is a copy of those three sketches. Options 1, 2 and 3 show a manual transmission, a display unit for displaying the different gear ratios, an engine control unit for controlling the engine and a stick shift having a switch pad (options 1 and 3) or up/down buttons (options 2) for initiating the shift. Genise explained that in response to the driver depressing the switch pad or up/down buttons, the engine control unit controls engine fueling so as to reach a zero torque level, thereby allowing the driver to move the shift lever to the neutral position. Genise further explained that after neutral was sensed, the engine control would

control engine fueling to approach the synchronization speed for the next gear (Genise Affd. ¶9).

5. On December 9, 1993, Genise prepared a project proposal for a concept AutoSplit, called "Electronically Enhanced Super 10". Exhibit D is a copy of the December 9, 1993 proposal. Exhibit D includes several options for implementing AutoSplit including different versions of the intent-to-shift switch.

6. On May 13, 1994, Genise prepared with the assistance of W. M. Mack an "AutoSplit Specification for the Concept Prototype". Exhibit E is a copy of the specification which includes a description of the different engine control routines for the system. Specifically, section 5.5.4 of Exhibit E describes the "predip" mode during which the AutoSplit algorithm fuels the engine to provide zero driveline torque, and a "sync" mode which occurs when neutral is sensed and which commands the engine to approach the synchronization speed for the newly selected gear.

7. Between May 1994 and July 1995 Eaton's automated transmission program included, besides AutoSplit, related automated transmission projects under the names "AutoShift" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All three of these projects were transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to

utilize the clutch and/or throttle pedal. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All of these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). Specifically, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

8. In May 1994, construction of a AutoSplit automated transmission prototype began. (Genise Affd. ¶11, Markyvech Affd. ¶6). Thomas Genise, Ron Markyvech and John Dresden III were the personnel at CORD-DC working on the AutoSplit project at this time (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Tom Genise was the system engineer for the AutoSplit project, Ron Markyvech was the software engineer for the project, and John Dresden III was the driver/mechanic for the project (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Exhibit 1 is a copy of a May 1994 project report prepared by Ron Markyvech and entitled "AUTOSPLIT CONCEPT PROTOTYPE" which included a general description of the AutoSplit transmission, and the work that was planned for the project. The project report shows that the object of the project was to design and build a concept prototype transmission to demonstrate the AutoSplit concept.

9. In August of 1994, a prototype of the AutoSplit transmission system was completed and implemented in a ten speed Freightliner truck. (Genise Affd. ¶11, Markyvech Affd. ¶8, Dresden Affd. ¶6). This AutoSplit prototype was successfully tested during a three day extensive road trip between August 29-31, 1994. (Genise Affd. ¶11 and 13, Markyvech Affd. ¶8, Dresden Affd. ¶6). The three day trip originated from Southfield, Michigan and included stops at Marshall, Michigan and Traverse, Michigan. The test driving team included Tom Genise, Ron Markyvech and John Dresden III. (Genise Affd. ¶12, Markyvech Affd. ¶8, Dresden Affd. ¶6). Exhibit 2 is a copy of a August 1994 Project Report for the AutoSplit project which mentions the August 29-31, 1994 AutoSplit road trip. Exhibit 3 is a copy of Ron Markyvech's Travel and Business Expense Report for the August 29-31, 1994 road trip. At the top right hand corner of the Expense Report, there is an indication that the expenses occurred from August 29 to August 31, 1994. Towards the bottom half portion of the Expense Report next to the heading "Purpose of Trip:", there is the notation "Project #5956-01 AutoSplit Concept Transmission Development Road Trip". Project #5956-01 was the project number for the AutoSplit project. (Markyvech Affd. ¶9). In the section explaining the day by day expenditures, there is an indication that Ron Markyvech paid for the meals of Tom Genise and John Dresden III.

10. The AutoSplit transmission system prototype that was successfully tested between August 29-31, 1994 was implemented in a Freightliner truck. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The Freightliner truck included an engine, an engine output shaft, an engine Electronic Control Unit (ECU) for controlling the engine speed and other engine parameters, a transmission ECU for controlling the engine ECU through a SAE J-1939 communication data link, a ten-speed transmission, a master clutch connected between the engine and the transmission, and a clutch pedal for controlling the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Exhibit 4 is a block diagram of the AutoSplit transmission system which was prepared by Ron Markyvech prior to January 1995, and is an accurate representation of the prototype tested between August 29-31, 1994. (Markyvech Affd. ¶10). Exhibit 4 shows a manual ten speed transmission, an engine control unit ECU2 connected to the engine via a J1939 data communication link input and output shaft sensors, a display unit for displaying the ten different gear ratios, and an intent-to-shift switch mounted on the shift lever and connected to the engine control unit.

11. The Freightliner truck also included transmission input and output shaft speed sensors, a manual stick shift for allowing the driver to manually shift the transmission between the ten different speed ratios, a display panel mounted on the shift

lever for displaying the presently engaged gear and the appropriate next gear, and a laptop computer which acted as an operator intent-to-shift control switch or button for sending a signal to the transmission ECU indicating whether an upshift or a downshift is to be initiated as the next gear shift, and for requesting that the engine be fueled to minimize driveline torque thereby allowing easy disengagement of an engaged ratio without requiring disengagement of the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

12. An upshift was initiated when the operator depressed keys of the keyboard of the laptop computer while an upshift was being displayed on the display, and a downshift was initiated when the operator depressed keys while a downshift was being displayed. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The operator intent to shift signal from the depressed keys of the keyboard initiated the upshift or the downshift by first signalling to the transmission ECU a desire to eliminate or minimize torque between the engine output shaft and the transmission output shaft. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Based upon receiving the operator intent to shift signal, the transmission ECU modified the engine fueling to reduce torque to the transmission without disengaging the master clutch. The operator could then easily shift the transmission to neutral. (Genise Affd. ¶13, Markyvech Affd. ¶10,

Dresden Affd. ¶7).

13. Based upon receiving the intent to shift signal, and after sensing that the transmission was shifted to neutral, the transmission ECU then controlled the engine to achieve a determined engine speed necessary for the next gear ratio. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

14. Exhibits 5-11 are photocopies of photographs of the actual hardware elements used during the August 29-31, 1994 trip. Specifically, Exhibit 5 is a photograph of the actual ten-speed transmission used in the test. Exhibit 6 is a photograph of the actual transmission ECU, Exhibit 7 is a photograph of the actual engine and engine ECU, Exhibit 8 is a photograph of the actual electrical wiring harness, Exhibit 9 is a photograph of the actual display panel which was mounted on the shift lever, Exhibit 10 is a photograph of the actual master clutch foot pedal, and Exhibit 11 is a photograph of the actual truck used during the August 29-31, 1994 trip. (Genise Affd. ¶14, Markyvech Affd. ¶11, Dresden Affd. ¶8).

15. The AutoSplit transmission system tested during the August 29-31, 1994 trip included several software engine control routines. These software routines were implemented in the transmission ECU. (Genise Affd. ¶15, Markyvech Affd. ¶12). Exhibit 12 is a printout of the actual software code contained in the transmission ECU during the August 29-31, 1994 test trip.

The front page of Exhibit 12 identifies the dates of the various files contained in the software program, with the latest date being August 29, 1994. With the assistance of Tom Genise, Ron Markyvech wrote the software program of Exhibit 12 which is written in "C" computer language. (Genise Affd. ¶15, Markyvech Affd. ¶12).

16. One of the several software engine control routines of Exhibit 12 is able to predict or determine zero flywheel torque based on system variables, and then modify engine speed to achieve the zero torque condition. (Genise Affd. ¶16, Markyvech Affd. ¶13). The zero torque condition enables the driver to easily move the transmission out of gear engagement and into the neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶16, Markyvech Affd. ¶13). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶15, Markyvech Affd. ¶13). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine fueling such that a zero torque condition exists. (Genise Affd. ¶16, Markyvech Affd. ¶13). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero

torque value. (Genise Affd. ¶16, Markyvech Affd. ¶13). During the test road trip of August 29-31, 1994, the laptop Personal Computer (PC) was connected to the communication data link of the AutoSplit system. (Genise Affd. ¶16, Markyvech Affd. ¶13). This allowed the PC to display the predicted torque percentage for achieving zero flywheel torque. (Genise Affd. ¶16, Markyvech Affd. ¶13). During testing on the road trip, function intent_final_pct_trq was commanded to equal the predicted torque percentage as well as other torque percentages. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the zero torque condition existed, the transmission was manually moved out of gear engagement and into a neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function determine_gear from module trns_act.c96 determined when the transmission moved to the neutral. (Genise Affd. ¶16, Markyvech Affd. ¶13).

17. The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at

the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

18. The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if statement "toggle" varied the engine speed above and below the

true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

19. During the August 29-31, 1994 road trip, the AutoSplit transmission system was extensively tested by monitoring data on the PC. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). In particular, the testing included monitoring the torque values after the intent-to-shift switch was recognized by the transmission ECU; monitoring when the transmission was shifted into neutral; monitoring and evaluating the various engine control parameters in different modes of operation (including the torque control mode and speed control mode); and monitoring the transmission input shaft speed. The testing also included evaluating data at the time the transmission shifted into gear and considering the "feel" of the shift for purposes of determining shift quality. (Genise Affd. ¶17 , Markyvech Affd. ¶14, Dresden Affd. ¶10).

20. The road trip of August 29-31, 1994 was considered successful by Genise, Dresden and Markyvech as the AutoSplit transmission system performed well throughout the testing, including successfully operating in the torque control mode and in the speed control mode, during various shift sequences. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). The

results were reported in a Technical Report on February 21, 1995 which is discussed in connection with Exhibit 21.

21. During the development of the AutoSplit transmission system, Thomas Genise and Ron Markyvech periodically gave technical presentations to engineers at the Transmission Division of Eaton's Truck Components Operations North America (TCONA) regarding the development and operation of the AutoSplit transmission system. (Genise Affd. ¶18, Markyvech Affd. ¶15). These presentations often included a detailed discussion of the software code. (Genise Affd. ¶18, Markyvech Affd. ¶15). On September 29, 1994, Ron Markyvech went to TCONA in Galesburg, Michigan to give such a presentation. Exhibit 13 is a copy of an Expense Report dated September 30, 1994, that Ron Markyvech submitted in connection with the September 29, 1994 trip and presentation. The "Purpose of Trip" section of this Expense Report includes the statement: "Project #5956-01 went TCONA for software code walk through and technical presentation on the AutoSplit concept." (Markyvech Affd. ¶15).

22. The AutoSplit transmission prototype was subsequently demonstrated to engineers of Eaton's TCONA on January 11, 1995. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). Tom Genise and Ron

Markyvech performed the demonstration. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The Eaton TCONA engineers that attended the demonstration included John Steeby and Warren Dedow, and the structure and operation of AutoSplit were understood by Steeby and Dedow. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶6, Steeby Affd. ¶6). Exhibit 14 is a partial printout of Ron Markyvech's 1995 Personal log. The entry for January 11, 1995, indicates that Markyvech went to Marshall, Michigan and demonstrated the AutoSplit transmission system implemented in the Freightliner truck. During the September 12, 1994 and the January 11, 1995 demonstrations, John Steeby and Warren Dedow each drove the truck. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7, Steeby Affd. ¶7). The AutoSplit transmission prototype performed well during these demonstrations, operating in the torque control mode and in the speed control mode during various shift sequences providing clutchless and throttleless shifting for the multi-speed transmission. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7-9, Steeby Affd. ¶7-9).

23. The AutoSplit transmission system demonstrated on January 11, 1995 was basically the same system previously demonstrated on September 12, 1994 and tested during the road trip of August 29-31, 1994. (Genise Affd. ¶20, Markyvech Affd. ¶17). One difference between the systems concerned the shift

display. In the system demonstrated on September 12, 1994 and tested between August 29-31, 1994, the top portion of the shift lever contained a display for displaying the currently engaged gear and the next gear (Genise Affd. ¶20, Markyvech Affd. ¶17; Exhibit 9). In the system demonstrated on January 11, 1995, the display was re-configured as a separate device mounted on the truck's console. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 15 is a photocopy of the actual display used at the January 11, 1995 demonstration.

24. Another difference between the two systems concerned the shift lever. In the system demonstrated on September 12, 1994 and tested during August 29-31, 1994 trip, the driver intent-to-shift switch was not placed on the shift lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). During the August 29-31, 1994 trip, the intent-to-shift switch was the PC. The PC was connected to the system's communication data link and the intent-to-shift command was inputted by depressing keys on the keyboard of the PC. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). In the AutoSplit system demonstrated on January 11, 1995, a new shift lever was implemented which included an intent-to-shift switch or button on the lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 16 is a photocopy of the actual shift lever with the intent-to-shift button used during the January 11, 1995

demonstration. The intent to shift button was added to the shift lever on November 10, 1994 as indicated by the entry for this date in Ron Markyvech's log (Exhibit 17) .

25. There was also a modification to the software that was demonstrated on January 11, 1995. Exhibit 18 is a copy of the software code implemented in the transmission ECU demonstrated on January 11, 1995. According to this code, function sequence_shift will call function shift_initiate which will set engine_commands to ENGINE_PREDIP which then calls function control_engine_predip to control automatically the engine torque parameter to zero as a function of predicted zero torque. (Genise Affd. ¶21, Markyvech Affd. ¶18).

26. A further demonstration of the Freightliner truck including the AutoShift system occurred on July 14, 1996 at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Thomas Genise described and demonstrated the AutoSplit transmission system on July 14, 1995 to engineers and upper management of Eaton Corporation. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Exhibit 19 is a Travel Expense Report that Genise submitted on July 17, 1995 for the travel he conducted the week of July 10, 1995. This travel included the July 14, 1995 demonstration trip. The "Purpose of Trip" section of the Report indicates that on July 14, 1995, Genise demonstrated the AutoSplit to TCONA management. Exhibit

19 also includes the Travel Expense Report of Ron Markyvech which indicates that he took the AutoSplit Concept Truck for the Automation Planning Meeting.

27. The AutoSplit transmission system demonstrated on July 14, 1995, included the same hardware components and operated according to the same software structure described above in connection with the AutoSplit transmission system demonstrated on January 11, 1995. (Genise Affd. ¶23). The AutoSplit transmission system worked well during the demonstration performing clutchless and throttleless shifts and operating in the torque control mode and speed control mode during various shift sequences. Exhibit 20 is a memo from William A. Baken dated July 17, 1995 setting forth the "Automation Strategic Planning Meeting Minutes" for the July 14, 1995 meeting/demonstration. The third page of the memo indicates that Thomas Genise demonstrated the AutoSplit Concept Truck. Attached to the memo there is a copy of the Agenda for the July 14, 1995 meeting/demonstration. The Agenda indicates that ride and drive demonstrations were available at 7:00 am and 1:00 pm on July 14, 1995.

28. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Transmission prototype. (Genise Affd. ¶22). Exhibit 21 is a copy of the February 21, 1995 Technical Report which includes descriptions of the various control algorithms, and also provides plotted data of system

parameters taken during actual vehicle shift testing.

29. Fig. 1 on page 5 of Exhibit 21 shows a block diagram of the AutoSplit system which includes a multi-speed transmission, an engine, an engine controller ECU2 connected to the engine via a J1939 communication data link, and a driver display for displaying the presently engaged gear, and a possible or desirable upshifted/downshifted gear.

30. The "intent-to-shift" button - described on page 2 of Exhibit 21 - is located on the side of the shift lever and is operated by the driver's thumb. Exhibit 21 describes the software variable for zero driveline torque: needed_percent_for_zero_flywheel_trq. (Exhibit 21, ps. 13-14). This variable is requested via the engine communication data link J1939 by the engine controller (Exhibit 21, p. 12).

31. The AutoSplit Technical Report was signed and approved by Eugene Braun, and was widely distributed throughout Eaton Corporation. The individuals receiving the AutoSplit Technical Report included Ron Markyvech, Jon Steeby, Warren Dedow, Steve Edelen and Marcel Amsallen (Exhibit 21, cover page).

32. As indicated, during the period of time from the beginning of July 1995 through the end of June 1996, the automated transmission program of Eaton Corporation included related projects under the names "AutoShift", "AutoSplit" and "Top Two". During this time period, continuous efforts were made

to develop these related projects so as to provide commercially viable transmission systems. (Genise Affd. ¶24 , Markyvech Affd. ¶19).

33. These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal, thereby assisting the driver with the shift sequence. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral from a gear to be disengaged, and to achieve engine synchronization speed for clutchless engaging a target gear ratio. (Genise Affd. ¶24, Markyvech Affd. ¶19).

34. During the period of time from the beginning of July 1995 through the end of June 1996, Thomas Genise, along with Ron Markyvech under Genise's supervision continuously worked on developing products for heavy duty trucks in Eaton's automated transmission program. (Genise Affd. ¶24-30, Markyvech Affd. ¶19).

35. Exhibit 22 includes the time sheets for Ron Markyvech, Tom Genise and John Dresden III between July 1995 and June 1996.

As indicated in the table below, the majority of Genise's and Markyvech's time, for each month between July 1995 and June 1996, was spent on developing products for the AutoShift/AutoSplit/Top-Two automated transmission projects.

Ron Markyvech	
July '95	83.5 hours
August '95	109.5 hours
Sept. '95	133.0 hours
Oct. '95	169.0 hours
Nov. '95	137.0 hours
Dec. '95	83.5 hours
Jan. '96	101.5 hours
Feb. '96	90.0 hours
Mar. '96	121.0 hours
Apr. '96	121.0 hours
May '96	131.5 hours
June '96	81.0 hours
Total	1,361.5 hours

Tom Genise	
July '95	111.0 hours
Aug. '95	108.5 hours
Sept. '95	111.0 hours
Oct. '95	159.5 hours
Nov. '95	162.5 hours
Dec. '95	121.0 hours
Jan. '96	172.5 hours
Feb. '96	135.5 hours
Mar. '96	119.0 hours
Apr. '96	95.5 hours
May '96	80.5 hours
June '96	110.5 hours
Total	1,487 hours

36. Exhibit 23 includes Markyvech's personal logs for 1995 and 1996. These logs detail his work activity on a daily basis for 1995 and 1996. Exhibit 24 is a collection of Genise's monthly reports for the period between July 1995 and June 1996 as well as the Genise's Travel Expense Reports during this period. Below is a summary of Genise's and Markyvech's product development activities between July 1995 and June 1996 relating to Eaton's AutoSplit/AutoShift/Top Two automated

transmission projects.

37. In July 1995, Tom Genise and Ron Markyvech worked on the AutoShift and AutoSplit automated transmission projects. On July 12, 1995, Tom Genise travelled to Galesburg, Michigan to attend a J1939 data communication link meeting. Markyvech's personal log (Exhibit 23) indicates that towards the end of July, Markyvech worked on the transmission manager code for the AutoShift 7-speed transmission project.

38. Throughout August 1995, Markyvech worked on development of the 7 speed AutoShift project. This work included identifying a problem with the reverse gear switch. Specifically, on August 28, 1995, Markyvech uncovered that the reverse gear switch would give a mismatch when trying to engage low gear. This mismatch problem was caused because software function "x_outside_offset" was too small. On August 22, 1995, Genise prepared a Functional Performance Specification for the AutoSplit project (Exhibit 25). On August 30, 1995, Genise distributed an AutoSplit Design Specification sheet (Exhibit 26). Exhibit states that "TACONA has identified the AutoSplit transmission concept as an integral part of their automatic product strategy".

39. On September 29, 1995, Genise travelled to Galesburg, Michigan to attend an automation team meeting. On September 30, 1995, Genise prepared Revision 1.0 of the AutoSplit Product

Design Specification (Exhibit 27). In September 1995, Markyvech worked on the AutoSplit and AutoShift transmission projects. On September 11, 1995, Markyvech stripped the AutoSplit wire harness out of a test vehicle for use in the 7 speed AutoShift test vehicle. Much of the remainder of the month was spent installing and testing the vehicle interface wiring. Markyvech's September 1995 Report for the 7 speed AutoShift details the accomplishments for the month including modification of the base AutoShift software, testing the Freightliner vehicle wire harness, modifying the four rail shift bar housing, installing the transmission in a truck, and starting initial system debugging.

40. In October 1995, Markyvech spent most of his time working on the 7 speed AutoShift vehicle software. Markyvech's October 1995 Report for the 7 Speed Autoshift details the accomplishments for the month which includes modifying the software to account for the varying step sizes of the seven speed transmission, and modifying the software to include the capability of adjusting the upshift point based on the target gear. On October 12, 1995, Genise travelled to Milford, Michigan to grade test the AutoShift transmission system. On October 30, 1995, Genise prepared a Design Specification (Exhibit 28) which indicates that revisions to the AutoSplit development will be continued under another project. Genise also prepared on October 30, 1995, a revised AutoSplit Design Specification (Genise Affd.

¶24; Exhibit 29).

41. Between November 1-3, 1995, Genise travelled through northern Michigan test driving the AutoShift transmission system. On November 17, 1995, Genise prepared a revised Functional Performance Specification for the AutoSplit project (Exhibit 30). On November 13 and 28, 1995, Genise travelled to Galesburg and Southfield, respectively, test driving the AutoShift transmission. On November 22, 1995, Genise traveled to Traverse City, Michigan, test driving the 7 speed AutoShift system. In November 1995, Markyvech continued work on the 7 speed Autoshift project. On November 21, 1995, Markyvech wrote a miles/hour - function MI_PER_HOUR - reading software routine for the AutoShift, and bench tested the routine. On November 28, 1995, Markyvech tested the AutoShift truck to obtain acceleration data. Markyvech's November 1995 Report for the Autoshift 7-Speed Prototype indicates the accomplishments for the month as including testing the vehicle, and demonstrating the vehicle on November 11, 1995. In November Markyvech also started work on the Top Two project. On November 13, 1995, Markyvech went to Galesburg, Michigan to pick up the Top Two truck that was to be used for evaluation purposes.

42. On December 5, 1995, Genise travelled to Marshall, Michigan test driving the Top 2 truck. On December 20, 1995, Genise travelled to Galesburg, Michigan, for a demonstration of

the AutoShift transmission system. In December 1995, Markyvech started working on the performance code for the 10 speed AutoShift. On December 11, 1995, Markyvech tested the performance code for the 10 speed AutoShift. On December 21, 1995, Markyvech tested the 10 speed Autoshift in different performance modes of operation. Markyvech's December 1995 Report indicates that the accomplishments for the month included installing and testing various software code for allowing the engine to upshift at higher engine RPMs, for adding an additional 400 RPMs to the deceleration rate of the engine during upshifts, for allowing double upshifts, and for using the engine compressing brake when doing skip shifting.

43. Genise and Markyvech spent much of January 1996 developing a skip shiftability function for the AutoShift transmission system. On January 31, 1996, the skip shiftability feature was demonstrated to Marcel Amsallen of Eaton Corporations' Truck Component Operation North Americas (TCONA) in Galesburg, Michigan. On January 16, 1996, Genise travelled to Milford, Michigan, test driving the AutoShift. On January 31, 1996, Genise travelled to Galesburg, Michigan to demonstrate the AutoShift software and to meet with TCONA people. Genise's January 1996 Monthly Report states that during this month, the AutoShift Shift algorithm was modified to include skip shifting, and was made more adaptive to actual engine braking

effectiveness. Markyvech also attended a meeting on January 11 at TCONA in connection with the Top-Two project. Markyvech's January 1996 Report indicates that the skip shift algorithms were developed, and that an adaptive algorithm that monitors the turn off delay of the engine compression brake used on skip upshifts was incorporated into the software.

44. Genise's February 1996 Monthly Report indicates that on February 7, 1996, the modified AutoShift software that included skip shifting was demonstrated. Further, during this month, a task was added to evaluate a modified pneumatic inertia brake used to speed up shifting, and test software was written that allows the AutoShift truck to be used as the stationary test stand. On February 27, 1996, Genise travelled to Calamus, Michigan to attend a Top 2 team product development meeting. In February, 1996, Markyvech worked on the Top 2 project which was implemented in a Mack truck. Markyvech also continued work on the AutoShift project. On February 15, 1996, Markyvech worked on getting his laptop computer to run the ENG2 diagnostic software. On February 26, 1996, Markyvech worked on AutoShift truck-as-test-stand code. Markyvech's February 1996 AutoShift Support Report indicates that test software was written that allows the AutoShift truck to be used as a stationary test stand. Markyvech's February 1996 Report entitled "Top Two Continued Support" indicates that accomplishments for February 1996

included receiving software and hardware packages for testing and evaluation, and implementing engine controller ENG2 diagnostic software on a desk top PC.

45. Genise's March 1996 Monthly Report - which mistakenly states that it is for the month of February - indicates that on March 26, 1996, a meeting was held to discuss a method of routing pressurized oil from the transmission internal oil pump. The Report also indicates that during March 1996, software regarding the SEL_GEAR module was written, incorporated into the Mack system and tested. Genise's March 1996 report entitled "AutoShift Support" also mentions the oil routing method for the AutoShift transmission. On March 29, 1996, Genise travelled to Dearborn, Michigan to obtain hardware for the Volvo AutoSplit Truck. Much of Genise's work in March 1996 was spent working on software for the Top Two project. This included work on the select gear module SEL_GEAR on March 14, 15 and 21. Markyvech's March 1996 Report entitled "Mack Top Two Concept Prototype" indicates that the accomplishments for March 1996 included writing and incorporating the SEL_GEAR module. Further, a competitive comparison was prepared for the Mack system versus the AutoShift system. In addition, at the end of March Markyvech worked on the AutoSplit project. Specifically, on March 28-30, Markyvech worked on installing a wiring harness for an AutoSplit system in a test vehicle.

46. Genise's April 1996 Report indicates that during this month an AutoSplit system was installed in a Volvo truck. Genise's April 1996 Report entitled AutoShift Support indicates that a new test was prepared that uses the integral oil pump in the transmission. In the beginning of April 1996, Markyvech worked on installing the AutoSplit wiring harness. On April 22, Markyvech worked on the torque transducer software/calibration. Markyvech also worked on the Mack Top Two towards the end of April. Markyvech's April 1996 Report entitled MACK TOP TWO CONCEPT PROTOTYPE indicates that during April 1996 software coding efforts continued. Markyvech's April 1996 Report entitled "Volvo AutoSplit Retrofit" indicates that the AutoSplit system was installed in a new Volvo vehicle that was supplied to TCONA, and that repairs were made to the wiring harness during the installation.

47. Genise's May 1996 Monthly Report indicates that approximately 80 percent of the software code needed for the Mack Top Two has been designed, written, compiled and integrated into the bench top system. On May 16, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. On May 22, 1996, Genise made a trip to Mack Truck, Inc. to discuss the Top 2 project. On May 15, Genise prepared a document entitled "Volvo AutoSplit RetroFit" (exhibit). The purpose of this document was to document the efforts on installing the AutoSplit transmission

system in a vehicle for demonstration and evaluation purposes. On May 28, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. Further, Genise's May 1996 Report entitled "AutoShift Support" indicates that during this month plans were being made with TCONA to continue testing and development of 25 AutoShift units. Markyvech spent most of his time in May 1996 working on the Mack Top Two. On May 8, 1996, Markyvech performed tests regarding output shaft speed acceleration. On May 14, Markyvech worked on debugging the skid detection routine. Towards the end of May, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. Markyvech's May 1996 Report entitled "Mack Top Two Concept Prototype" indicates that work continued on the software code, and by May 1996 approximately 4.4K bytes of code had been written. Further, the Report indicates work on testing and debugging of the Top Two software modules.

48. Genise's June 1996 Monthly Report indicates that development on the AutoShift system continued. On June 13, 1996, Markyvech travelled to Southfield, Michigan to obtain supplies for the AutoSplit installation. On June 18, 1996, Genise travelled to Warren, Michigan, in connection with the AutoSplit truck. On July 1, 1996, Genise travelled to Marshall proving grounds for an AutoSplit demonstration. In the beginning of June 1996, Markyvech worked on getting the Mack Top Two to shift

automatically on the bench. On June 10, Markyvech worked on the resync portion of the Mack Top Two software code. Markyvech's June 1996 Report entitled "Mack Top Two Concept Prototype" indicates that initial software was approximately 90 percent complete. During the last two weeks of June, Markyvech worked on installing the AutoSplit in a new vehicle for purposes of testing and evaluation. Markyvech's June 1996 Report entitled "AutoSplit Continued Development" also discusses the AutoSplit transmission installation.

X. DISCUSSION

A. Genise Is Entitled To Priority Based On (1) Actual Reduction To Practice Prior To The Filing Date of the Desautels et al '477 Patent And (2) Conception Plus Diligence To Constructive Reduction To Practice

1. Law Of Actual Reduction To Practice

In order to demonstrate an actual reduction to practice for purposes of showing priority in an interference, the device or process must include every essential limitation of the count. Correge v. Murphy, 217 USPQ 753 (Fed. Cir. 1983). Further, the reduction to practice must show the practical usefulness of the invention. Symmes v. King 21 USPQ 2d 1462 (Fed. Cir. 1991).

In the present case there were multiple reductions to practice of the invention. Specifically, reduction to practices occurred in August 1994, January 1995 and July 1995.

Applicant is submitting herewith the Affidavits of Thomas A. Genise, Ronald K. Markyvech and John Dresden III. These

individuals developed, built and tested the AutoSplit automated transmission system. (Genise Affd. ¶11-12, Markyvech Affd. ¶5-8, Dresden Affd. ¶5-7). These Affidavits together with the attached documentary evidence establish that the AutoSplit transmission system was implemented in a Freightliner truck having a ten speed transmission, and that the Freightliner truck having the ten speed AutoSplit transmission successfully completed a three day road test between August 29-31, 1994. (Genise Affd. ¶13, Markyvech Affd. ¶8, Dresden Affd. ¶6). Further, these Affidavits establish that the Freightliner truck having the AutoSplit transmission was successfully demonstrated on January 11, 1995 and July 14, 1995 to engineers of Eaton Corporation's Corporate Research & Development-Detroit Center and of Eaton's Transmission Division. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18).

Applicant is also submitting the Affidavits and attendant documentary evidence of Jon Steeby, Steven Edelen and Warren Dedow. Steeby, Edelen and Dedow were all familiar with the AutoSplit transmission hardware and software. (Edelen ¶7-8, Dedow Affd. ¶6). Steeby and Dedow attended the demonstration on January 11, 1995 during which they drove the Freightliner truck containing the AutoSplit transmission system. (Steeby Affd. ¶7, Dedow Affd. ¶7). Edelen and Steeby attended the demonstration on

July 14, 1995. (Edelen Affd. ¶8 and Steeby Affd. ¶5).

The affidavits and accompanying documents submitted herewith demonstrate that the AutoSplit transmission system was an operable working transmission system on August 29-31, on January 11, 1995, and on July 14, 1995 - all of which are prior to the July 27, 1995 filing date of the Desautels et al '477 patent. These Affidavits and accompanying documents also establish that the AutoSplit transmission system prototype included every limitation recited in the proposed Counts 1 and 2.

Specifically, the Affidavits and documentary evidence establish that the Freightliner truck with the 10 speed AutoSplit transmission demonstrated on August 29-31, on January 11, 1995, and on July 27, 1995 each contained: an engine having an output shaft; a multi-speed transmission connected to the engine output shaft; an engine control to control engine fueling of the engine; and an operator input for allowing the operator to signal a desire to eliminate torque between the engine and the transmission (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-8, Edelen Affd. ¶8-11, Dedow Affd. ¶7-8). The evidence also indicates that the engine control determined a zero torque fuel parameter value for the engine that approximated a zero torque load on the connection between the engine and the transmission; that the engine control operated to control the engine fueling to achieve the zero torque parameter value; and

that after the zero torque fuel parameter value was obtained, the transmission was manually moved out of engagement to a neutral position (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-9, Edelen Affd. ¶8-13, Dedow Affd. ¶7-9). Specifically, the software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine speed such that a zero torque condition exists. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18).

The evidence demonstrating the reduction to practice of the AutoSplit is summarized below in table form.

Count 1	**AutoSplit Truck Transmission Concept Prototype - Reduction To Practice**
A vehicle drive comprising:	Exhibits 5-11 show the vehicle drive of the AutoSplit system.
an engine having an output shaft;	Exhibit 7 shows an engine having an output shaft.

Count 1	**AutoSplit Truck Transmission Concept Prototype - Reduction To Practice**
a transmission selectively connected to said engine output shaft, said transmission having several selectively actuated speed ratios, said transmission having a transmission output shaft, said selected speed ratios controlling the ratio of the input speed from said engine output shaft to the output speed of said transmission output shaft; and	Exhibit 5 shows a multi-speed (ten) transmission selectively connected to the engine output shaft and having an output shaft.
an engine control to control a parameter of said engine, said engine control including an operator input to allow an operator to signal a desire to eliminate torque between said engine output shaft and said transmission output shaft, said operator signal requesting said engine control to determine a zero torque parameter value for said engine output shaft that approximates a zero torque load on the connection between said engine and said transmission, and said engine control being operable to control said engine to achieve said zero torque parameter value.	Exhibit 6 shows the engine control unit which controls engine fueling (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The AutoSplit system included an intent-to-shift switch (PC on August 29-31 and September 12, 1995 and Exhibit 16) for allowing the operator to indicate a desire to eliminate torque between the engine output shaft and the transmission output shaft. Exhibits 12 and 18 include software functions determine_shiftability_ variable and needed_percent_ for_zero_flywheel_trq which approximate a zero torque between the engine and the transmission. Exhibits 12 and 18 also include software functions control_intent-to_ shift and intent_final_pct-trq which serve to modify engine speed such that a zero torque condition exists.

Count 2	AutoSplit Truck Transmission Concept Prototype - Reduction to Practice
A method of operating a vehicle drive comprising the steps of:	The AutoSplit system operated the vehicle drive shown in Exhibits 5-11.
a. providing an engine, an engine parameter control, a multi-speed transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, a manual stick shift for change speed ratios in said transmission;	Exhibit 7 shows the engine, Exhibit 6 shows the engine control unit for controlling engine fueling, Exhibit 5 shows a multi-speed transmission, and Exhibits 9 and 16 show a manual stick shift for changing speed ratios.
b. predicting a zero torque parameter value for said engine based on system variables;	Exhibits 12 and 18 include functions determine_ shiftability_variable and needed_percent_for_zero_ flywheel_trq for predicting zero torque based on system parameters.
c. modifying said engine parameter by said engine control to achieve said zero torque value; and	Exhibits 12 and 18 include software functions control_ intent_to_shift and intent_ final_pct_trq which serve to modify engine speed such that a zero torque condition exists.
d. manually moving said transmission out of engagement to a neutral position.	The AutoSplit system was manually moved out of engagement to a neutral position (Steeby Affd. ¶7-9), Dresden Affd. ¶7-10).

The foregoing clearly establishes an actual reduction to practice of the invention defined in proposed Counts 1 and 2 on August 29-31, 1994, on February 11, 1995 and on July 14, 1995.

2. Conception

As set forth in Mergenthaler v. Scudder, 11 App. D.C. 264, 1897 C.D. 724:

> The conception of the invention consists in the complete performance of the mental part of the inventive act. All that remains to be accomplished in order to perfect the act or instrument belongs to the department of construction, not invention. It is, therefore, the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice that constitutes an available conception within the meaning of the patent law.

See also, Coleman v. Dines, 224 USPQ 857 (Fed. Cir. 1985) and Oka v. Youssefyeh, 7 USPQ2d 1169 (Fed. Cir. 1988).

The facts of record indicate a conception of the invention in 1993. A written description of the invention in proposed Counts 1 and 2 are set forth in the Specification-type document (Exhibit A) Genise's presentation materials (Exhibit B), Genise's project proposal (Exhibit C), Genise's specification (Exhibit D), the software code printouts (Exhibits 12 and 18) and the Technical Report (Exhibit 21) - all of which are prior to July 27, 1995 - the filing date of the '477 patent. For purposes of simplifying the analysis, the Technical Report (Exhibit 21) entitled "AutoSplit truck Transmission Concept Prototype" dated February 21, 1995 will be compared relative to the elements/steps of proposed Counts 1 and 2 to demonstrate a conception prior to the '477 patent's filing date of July 27, 1995. This report was approved by Eugene Braun, Genise's supervisor (Exhibit 21, cover

page), and was widely distributed to numerous engineers and management personnel at Eaton Corporation (Exhibit 21; Genise Affd. ¶22). Set forth below is the comparison of the elements/steps of proposed Counts 1 and 2 and the February 21, 1995 Technical Report (Exhibit 21).

Count 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A vehicle drive comprising:	Exhibit 21 - Abstract describes a vehicle drive.
an engine having an output shaft;	Exhibit 21 - page 5 shows a J1939 data communication line connected "To Engine" which inherently includes an output shaft
a transmission selectively connected to said engine output shaft, said transmission having several selectively actuated speed ratios, said transmission having a transmission output shaft, said selected speed ratios controlling the ratio of the input speed from said engine output shaft to the output speed of said transmission output shaft; and	Exhibit 21 - page 5 shows a 10 speed Transmission which is connected to the engine output shaft. The transmission depicted includes an output shaft.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
a. providing an engine, an engine parameter control, a multi-speed transmission driven by an output shaft of said engine, said transmission being provided with several selectively actuated speed ratios, a manual stick shift for change speed ratios in said transmission;	Exhibit 21 - page 5 shows a 10 speed Transmission which is connected to the engine output shaft. The transmission depicted includes an output shaft. Page 5 also shows a manual stick shift for changing speed ratios of the 10 speed transmission, and an engine controller ECU 2 for controlling an engine parameter of the engine via data communication link J1939.
b. predicting a zero torque parameter value for said engine based on system variables;	Pages 12-14 of Exhibit 21 describe the zero torque driveline torque software control algorithm for predicting a zero torque parameter value for the engine based on system parameters.
c. modifying said engine parameter by said engine control to achieve said zero torque value; and	Pages 12-14 of Exhibit 21 describe the operation of modifying the engine fueling to achieve the zero torque value in response to initiation of the software control algorithm.
d. manually moving said transmission out of engagement to a neutral position.	Exhibit 21 - page 5 shows a manual stick shift for moving the transmission out of engagement to a neutral position, and page 12 describes the operation of the driver moving the lever to neutral while the clutch is engaged when the zero torque value is obtained.

As is apparent, the February 21, 1995 Technical Report

entitled "AutoSplit Truck Transmission Concept Prototype" includes every feature set forth in proposed Counts 1 and 2, and therefore constitutes a complete conception of the invention.

3. Diligence

Diligence consists of activity directed toward reduction to practice of an invention or overcoming obstacles to reduction to practice. Diligence must be shown during the "critical period", i.e., from just before entry of the rival inventor into the field, to actual or constructive reduction to practice. Moller v. Harding, 214 USPQ 724 (Bd. Pat. Int. 1982). During the critical period there must be "reasonably continuous activity". Burns v. Curtis, 80 USPQ 587 (CCPA 1949).

In the present case the critical period begins just before July 27, 1995, the filing date of the Desautels et al '477 patent. It ends with Genise's constructive reduction to practice on June 19, 1996, the date the subject application was filed in the Patent Office. The facts of record show continuous diligence during this critical period.

During the period of time from the beginning of July 1995 through the end of June 1996, Eaton Corporation Corporate Research & Development Center in Detroit, Michigan (CORD-DC) had an automated transmission development program for heavy duty vehicles. (Genise Affd. ¶24, Markyvech Affd. ¶19). Eaton's automated transmission program included related projects under

the names "AutoShift","AutoSplit" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶19). These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal (Genise Affd. ¶24, Markyvech Affd. ¶19). Each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

In the present case, the record shows that Genise and Markyvech - under the supervision of Genise - continuously worked during the critical period on implementing the invention defined by proposed Counts 1 and 2 in a heavy duty truck driveline. Besides supervising Markyvech in connection with the transmission automation projects, Genise designed the system and software requirements including algorithm design, and determined system requirements. (Genise Affd. ¶24-30). In addition, Genise prepared specification requirements, project/program plans, and technical reports in connection with the automated transmission program. (Genise Affd. ¶24-30). Markyvech's work concentrated primarily on software development and testing. (Markyvech Affd. ¶4 and 19). However, Markyvech also developed and tested the electrical system needed for communicating between the engine Electronic Control Unit (ECU), the transmission ECU and the various system

sensors, including the input and output shaft speed sensors. (Markyvech Affd. ¶4 and 19). Markyvech also tested the J1939 data communication link between the engine and transmission ECUs. (Markyvech Affd. ¶4 and 19). Further, the record shows that John Dresden III, under the supervision of both Genise and Markyvech built transmissions, assembled prototypes from stock transmissions, built and installed electrical and mechanical transmission components, such as hoses, sensors, brackets, ECUs, and tested transmissions including recording and obtaining data. (Dresden Affd. ¶4-5). The time records for Genise, Markyvech and Dresden show continuous work on developing the AutoSplit/AutoShift/Top Two transmission systems implementing the zero torque control feature of the present invention (Exhibit 22):

Cumulative Time For Genise, Markyvech and Dresden Between July 1995-June 1996	
July '95	194.5 hours
Aug. '95	285.5 hours
Sept. '95	329.0 hours
Oct. '95	375.0 hours
Nov. '95	364.5 hours
Dec. '95	233.5 hours
Jan. '96	286.5 hours
Feb. '96	261.5 hours
Mar. '96	284.5 hours
Apr. '96	258.0 hours
May '96	274.0 hours
June '96	219.5 hours
Total	3,366.0 hours

All of the above show continuous diligence with respect to developing a product implementing the present invention well before July 27, 1995, and continuing past June 19, 1996.

4. Corroboration

Corroboration consists of a rule of reason determination of whether the evidence as a whole supports the claimed invention. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). The purpose of

the corroboration requirement is to prevent fraud. Velsicol Chemical Corp. v. Monsanto Co., 579 F.2d 1038 (7th Cir. 1978). Evidence corroborating priority may be documentary or oral. Bell Telephone Laboratories v. Hughes Aircraft Co., 565 F.2d 654, 657 (3d Cir. 1977), cert. denied 435 U.S. 924 (1978). In determining whether evidence of an invention has been sufficiently corroborated, courts apply a rule of reason approach, performing a reasonable analysis of the total evidence. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). Corroboration therefore turns on the facts when viewed as a whole. Moreover, corroborative evidence need not consist of an actual witnessing of the reduction to practice -- circumstantial evidence alone can satisfy the corroboration requirement. Id. at 776.

In the present case, the reduction to practice of the invention between August 29-31, 1994 is corroborated by Markyvech and Dresden. The reductions to practice on January 11, 1995 is corroborated by Markyvech, Steeby and Dedow. The reduction to practice on July 14, 1995 is corroborated by Steeby and Edelen, as well as by the later document prepared by William Batten which provides the minutes of the July 14, 1995 transmission automation meeting. The August 1994 and January 1995 reduction to practice is also corroborated by documents including the February 21, 1995 Technical Report for the AutoSplit Truck Transmission which indicates that the AutoSplit transmission system was successfully

tested and demonstrated. (Exhibit 21).

Exhibit 21 provides a clear conception of the invention prior to July 27, 1995 filing date of the Desautels et al '477 patent. Exhibit 21 is corroborated by the Affidavits of Markyvech, Dedow, Edelen and Steeby. Each of these individuals received a copy of Genise's February 21, 1995 Technical Report detailing the invention defined in Counts 1 and 2.

XI. CONCLUSION

The evidence of record proves <u>prima facie</u> that Genise is entitled to priority relative to the July 27, 1995 filing date of the Desautels et al '477 patent based on :

(a) prior reduction to practices of the subject matter defined in proposed Counts 1 and 2 on August 29-31, 1994, January 11, 1995 and July 14, 1995; and

(b) prior conception plus diligence to the constructive reduction to practice date of June 19, 1996 (the filing date of the subject application).

Accordingly, the Examiner is respectfully requested to declare an interference between U.S. Patent No. 5,573,477 and the present application No. 08/666,164 pursuant to Applicant's Request under 37 CFR §1.607(a).

Respectfully submitted,

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Date: August 29, 1997

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

MAIL ROOM AUG 29 1997 39 PAT. & TRADEMARK OFF.

In re the Application of

THOMAS A. GENISE

Application No: 08/666,164 Group Art Unit: 3502

Filed: June 19, 1996 Examiner: T. Kwon

#13

For: AUTOMATED TRANSMISSION SYSTEM CONTROL WITH ZERO ENGINE FLYWHEEL TORQUE DETERMINATION

SECOND REQUEST FOR INTERFERENCE PURSUANT TO 37 C.F.R. § 1.607

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I. INTRODUCTION

Applicant hereby requests the declaration of an interference between this application Serial No. 08/666,164 to Genise ("Genise '164 application") and U.S. Patent No. 5,571,059 to Desautels et al ("Desautels '059 patent"). This request for interference is made in accordance with the provisions of 37 CFR §§ 1.607 and 1.608, and as specified therein sets forth among other things: (1) Counts for the Interference; (2) a showing that the Desautels '059 patent contains claims that correspond to the Counts; (3) a showing that the Genise '164 application contains claims that correspond to the Counts; and (4) a detailed explanation of Genise's right to priority, supported by Declarations and documentary evidence.

II. THE SUBJECT MATTER IN ISSUE

The subject matter of this potential interference deals with an operator input control system for assisting shifting in a multi-

speed transmission system. The operator input control system allows the operator to indicate that a particular shift is to be initiated and to request torque elimination between the transmission and the engine. Torque is provided between the engine and the transmission output shaft when the clutch members of a particular gear in the transmission are engaged. By breaking this torque, the transmission can more easily be shifted into a neutral position in which the clutch members of the gear are no longer engaged. Such a break in torque between the engine and the transmission is often referred to as "zero flywheel torque". After the torque is eliminated or reduced, and the operator is able to move the transmission to neutral, the system then begins to control the engine speed to a speed that is synchronized with the value necessary at the next gear so that a relatively smooth shift can be achieved.

III. THE INVOLVED PATENT AND APPLICATION

U.S. Patent No. 5,571,059 ("the Desautels et al '059 patent") issued to Desautels et al on November 5, 1996.

The present application U.S. Appln. No. 08/666,164 to Thomas A. Genise (the Genise '164 application) was filed on June 19, 1996. By the Amendment filed concurrently herewith, Applicant has amended the specification to indicate that the Genise '164 application is a continuation application of U.S. Appln. Nos. 08/649,830, 08/649,831 and 08/649,833, each filed April 30, 1996. Further,

Applicant is adding new claims 79-85 which correspond to claims 1, 2, 7, 8, 9, 14 and 17, respectively, of the Desautels et al '059 patent. Applicant is also adding new claims 141 and 142 which are similar to claims 1 and 9 of the Desautels et al '059 patent.

IV. THE PROPOSED COUNTS FOR INTERFERENCE

In accordance with 37 CFR §1.607(a)(2), Applicant proposes Counts 1 and 2 set forth below. Count 1 defines a vehicle drive, and Count 2 defines a method of operating a vehicle drive. Each of Counts 1 and 2 are recited in the "OR" format. The proposed Count 1 corresponds exactly to Desautels et al '059 patent claim 1 and to Genise '164 application claim 79 - or to claim 141 of the present application. The proposed Count 2 corresponds exactly to Desautels et al '059 patent claim 9 and to Genise '164 application claim 83 - or to claim 142 of the present application.

<u>COUNT 1</u>

A vehicle drive comprising:

an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;

a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;

a clutch that may be selectively actuated by an operator, said clutch

positioned between said engine and said transmission; and

an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit of whether an upshift or a downshift is to be initiated, and further providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.

OR

A vehicle drive comprising:

an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;

a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;

a clutch that may be selectively actuated by an operator, said clutch

positioned between said engine and said transmission; and

an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit that a particular shift is to be initiated, the input control providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon receiving said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.

COUNT 2

A method of operating a vehicle comprising the steps of:

a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission

to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit of when an upshift or a downshift is to be expected as the next shift, and further providing the operator the ability to request torque elimination and further providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;

b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;

c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;

d. providing a torque elimination request from said operator switch;

e. controlling an engine parameter to reduce the torque load from said engine on said transmission;

f. manually moving said transmission to neutral;

g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and

h. engaging said transmission in said next selected gear.

OR

A method of operating a vehicle comprising the steps of:

a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit that a particular shift is to be expected, the operator input switch system providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;

b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;

c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;

d. providing a torque elimination request from said operator switch;

e. controlling an engine parameter to reduce the torque load from said engine on said transmission;

f. manually moving said transmission to neutral;

g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and

h. engaging said transmission in said next selected gear.

V. DESIGNATION OF CLAIMS CORRESPONDING TO THE COUNTS

1. Identification of Claims In The Desautels et al '059 Patent Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(3), Applicant identifies apparatus claims 1-8 of the Desautels et al '059 patent as corresponding to proposed Count 1. The proposed Count 1 is claim 1 of the Desautels et al '059 patent (or claim 141 of the present application). All of the claims 1-8 of the Desautels et al '059 patent are proposed to correspond to Count 1 because they all define the same patentable invention.

Applicant identifies method claims 9-20 of the Desautels et al '059 patent as corresponding to proposed Count 2. The proposed Count 2 is claim 9 of the Desautels et al '059 patent (or claim 142 of the present application). All of the claims 9-20 of the Desautels et al '059 patent are proposed to correspond to Count 2 because they all define the same patentable invention.

2. Offer of Claims In This Application Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(4), Applicant submits that apparatus claims 79-82 and 141 of the Genise '164 application correspond to proposed Count 1, and that method claims 83-85 and 142 of the Genise '164 application correspond to proposed Count 2.

VI. SUPPORT FOR CLAIMS 79-85 and 141-142 OF THE GENISE '164 APPLICATION

In the Table below Applicant has applied each of the new claims 79-85 and 141-142 to the specification pursuant to 37 CFR §1.607(1)(5)(ii).

New Claims 79-85	**Specification of U.S. Appln. No. 08/666,164**
79. A vehicle drive comprising:	Fig. 3 shows a vehicle drive
an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;	Fig. 3 shows an engine 102 having an output shaft and an electronic control unit 112 and 146 for controlling engine output speed.
a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;	Fig. 3 shows a multi-speed transmission 10 selectively connected to the engine output shaft (via master clutch 104) and operable to convert drive from the engine output shaft to transmission output shaft 58 through several speed ratios (page 5, line 7 - page 6, line 11).

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and	Fig. 3 shows master clutch 104 is positioned between engine 102 and transmission 10. An operator selectively activates the clutch via manual clutch pedal 115 (page 9, lns. 18-20).
an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit of whether an upshift or a downshift is to be initiated, and further providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.	Fig. 3 shows an input control 120 for allowing the operator to request torque elimination during a shift and initiate an upshift/downshift (page 10, line 4 - page 12, line 4 24). If the display 124 indicates a lever shift is appropriate the operator may select same by using the intent to shift button, if the display indicates a lever downshift or upshift is appropriate the operator may select same by using the intent to shift button, if no lever shift is appropriate, the intent to shift signal is ignored (page 12, lines 13-24; page 12, line 31-page 13, line 30). Also, U.S.P. 4,361,060 and 4,648,290, both incorporated by reference (page 1, line 23), disclose manual switches for requesting/indicating an upshift or downshift.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
80. A vehicle drive as recited in claim 79, wherein an operator is able to indicate upshift or downshift without requesting torque elimination.	5,053,961 incorporated by reference on page 1, line 24, discloses an upshift or downshift control without requesting torque elimination.
81. A vehicle drive as recited in claim 79, wherein said electronic control unit achieves torque elimination by predicting an engine parameter that results in a zero torque load from the engine through the transmission, and beginning to move the engine parameter to that predicted value when a request for torque elimination is received.	Engine controller 112 controls engine fueling such that zero torque load is achieved in response to the depression of the intent to shift button 120. The parameters are predicted (see, page 3, lines 16-20; page 12, lines 15-18).
82. A vehicle drive as recited in claim 79, wherein a single switch having three positions is utilized to provide both the shift intent and the torque elimination request.	U.S. Patent 5,335,566 is incorporated by reference on page 2, line 1 and shows (Fig. 3) a 3-position switch 132 for selecting up or downshift (see, Fig. 3) and for causing the ECU to cause the engine to dither about zero torque (see, col. 7, line 67 to col. 8, line 4).
83. A method of operating a vehicle comprising the steps of:	The '164 application discloses a method of operating a vehicle.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit of when an upshift or a downshift is to be expected as the next shift, and further providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;	Fig. 3 shows an engine 102 having an output shaft, an electronic control unit 112 and 146 for controlling engine output speed, a transmission 10 selectively connected to the engine output shaft via master clutch 104 and operable to convert drive from the engine output shaft to transmission output shaft 58 through several speed ratios (page 5, line 7 - page 6, line 11). Fig. 3 shows an operator input switch 120 for allowing an operator to provide an indication of when an upshift/downshift is to be expected as the next shift. If display 124 indicates a lever shift is appropriate the operator may select same using intent to shift switch 120.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
and further providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;	The intent to shift switch 120 allows the operator to request torque elimination from the ECU so that the transmission can be moved to neutral without depressing the clutch (page 12, lines 13-25).
b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;	The intent-to-shift button 120 provides the ECU an indication of whether a shift is expected (page 12, lines 13-25).
c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;	Page 11, line 31 - page 12, line 12; page 13, lines 21-26.
d. providing a torque elimination request from said operator switch;	Intent-to-shift button 120.
e. controlling an engine parameter to reduce the torque load from said engine on said transmission;	In response to button 120, engine controller 112 reduces torque load.
f. manually moving said transmission to neutral;	Shift lever 57. Page 12, line 4.
g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and	Engine controller 112 controls engine fueling to achieve sync. speed. Page 12, lines 4-9.
h. engaging said transmission in said next selected gear.	Once sync. speed is achieved, the next gear is engaged. Page 12, lines 9-11.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
84. A method as recited in claim 83, wherein a single three position switch is utilized, with one position being no shift intent, a second position being an upshift indicated and torque elimination requested, and the third position being a downshift indicated with torque elimination also requested.	The intent to shift button 120 can be positioned to a no shift intent, to an upshift intent with torque elimination, and to a downshift intent with torque elimination. Page 12, lines 13-25.
85. A method as recited in claim 83, wherein said electronic control unit controls said engine even when no shift is occurring.	112 operates under commands from controller 146 on datalink DL even when no shift is occurring (page 9, lines 10-13).
141. A vehicle drive comprising:	Fig. 3 shows a vehicle drive.
an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;	Fig. 3 shows engine 102 and controller 146, 112 for controlling the output speed of the the engine 102.
a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;	Fig. 3 shows a transmission 12 selectvely connected to the engine 102 via master clutch 104 and operable to drive the engine output shaft through several gear ratios.
a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and	Fig. 3 shows the master clutch 104 selectively actuated by pedal 115 and disposed between engine 102 and transmission 12.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit that a particular shift is to be initiated, the input control providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon receiving said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.	Fig. 4 shows an operator intent to shift button 120 and a display 124 for allowing the operator to indicate to electronic controller 146, 112 that a particular shift upshift or downshift is to be initiated. The input control allows the operator to eliminate torque, and the electronic controller determines a desired engine speed for the next gear ratio based on receiving the intent to shift signal, and controls the engine to achieve the desired engine speed. When the torque is eliminated, the driver is able to move the shift lever 57 to the neutral position of the transmission. Fig. 4 and page 12, line 13 through page 13, line 30.
142. A method of operating a vehicle comprising the steps of:	Figs. 5A-5D show a mehod of operating a vehicle.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to said electronic control unit that a particular shift is to be expected, the operator input switch system providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;	Fig. 3 shows engine 102 and controller 146, 112 for controlling the output speed of the the engine 102. Fig. 3 shows a transmission 12 selectvely connected to the engine 102 via master clutch 104 and operable to drive the engine output shaft through several gear ratios. Fig. 3 shows the master clutch 104 selectively actuated by pedal 115 and disposed between engine 102 and transmission 12. Fig. 4 shows an operator intent to shift button 120 and a display 124 for allowing the operator to indicate to electronic controller 146, 112 that a particular shift upshift or downshift is to be initiated. The input control allows the operator to eliminate torque, and the electronic controller determines a desired engine speed for the next gear ratio based on receiving the intent to shift signal, and controls the engine to achieve the desired engine speed. When the torque is eliminated, the driver is able to move the shift lever 57 to the neutral position of the transmission. Fig. 4 and page 12, line 13 through page 13, line 30.

New Claims 79-85	Specification of U.S. Appln. No. 08/666,164
b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;	The intent to shift signal is provided to the controller 146, 112 after depression of the intent to shift signal indicating that an upshift or a downshift should be expected. Page 12, line 13 through page 13, line 30.
c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;	Fig. 4 and page 13, lines 22-30.
d. providing a torque elimination request from said operator switch;	Page 12, lines 13-18.
e. controlling an engine parameter to reduce the torque load from said engine on said transmission;	Page 12, lines 13-18.
f. manually moving said transmission to neutral;	Page 12, lines 18-20.
g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and	Page 13, lines 21-30.
h. engaging said transmission in said next selected gear.	Page 13, lines 21-30.

VII. THE BURDEN OF PROOF

Since the Genise '164 application was filed more than three months from the filing date of the Desautels et al '059 patent, Genise's burden is to establish <u>prima facie</u> entitlement to priority

relative to the Desautels et al '059 patent's filing date of July 27, 1995. 37 CFR §1.608(b).

VIII. SUMMARY OF APPLICANT'S POSITION

In support of his showing of priority, submitted herewith are the Affidavits of Thomas A. Genise, Ronald K. Markyvech, Warren R. Dedow, John Dresden III, Jon Steeby, James McReynolds and Steve Edelen together with contemporaneous documentary exhibits. This evidence will show the following:

1. Thomas A. Genise is an engineer at Eaton Corporation's Corporate Research & Development Center in Detroit, Michigan (CORD-DC) in the automated transmission development program for heavy duty vehicles. Since July of 1976 Ron Markyvech has worked at CORD-DC. Since 1990 Ron Markyvech has been a product engineer. Since 1990 James McReynolds has worked for Eaton Corp. as head of Product Planning and Strategic Planning for North America.

2. Between 1994 and 1996 the automated transmission development program of Eaton Corporation in which Genise and Markyvech worked include related automated transmission projects under the names "AutoShift", "AutoSplit" and "Top Two". These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. These projects had essentially the same or similar software structure for purposes of automating

and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral, and for automatically controlling the engine speed in order to obtain the synchronization speed for the next gear. The genesis of this technology is discussed below.

3. In early 1993, McReynolds conceived of a partially automated transmission system which would be easier to drive than a manual transmission system, but would be comparable in price to a manual transmission. In August 1994, McReynolds contacted Genise and explained the partially automated system for purposes of having Genise develop the system.

4. By August 1994, with the assistance of Ronald Markyvech and John Dresden III, Thomas Genise designed, developed, built and tested the AutoSplit partially-automated multi-speed transmission system which included the torque breaking system of the Counts. The AutoSplit transmission was implemented in a Freightliner truck having a ten speed transmission.

5. The Freightliner truck having the ten speed AutoSplit transmission included the subject matter defined in Counts 1 and 2, and successfully completed a three day road test between August 29-31, 1995. Thomas Genise, Ronald Markyvech and John Dresden all participated in the August 29-31, 1995 road trip.

6. The Freightliner truck having the ten speed AutoSplit

transmission was successfully demonstrated at Eaton Corporation's proving grounds in Marshall, Michigan, on January 11, 1995. Eaton engineers John Steeby and Warren Dedow who were familiar with the AutoSplit transmission including its software code structure, attended the demonstration and actually drove the Freightliner truck.

7. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Truck Transmission Concept Prototype. This Technical Report described the invention defined in Counts 1 and 2, and was widely distributed to Eaton engineers and members of Eaton's upper management.

8. On July 14, 1995, Eaton Corporation held an "Automation Strategic Planning Meeting" at Eaton's Proving Grounds in Marshall, Michigan. At this meeting trucks with automated transmissions including the AutoSplit, AutoShift and Top Two transmissions were demonstrated to several Eaton engineers and members of upper management. Thomas Genise successfully demonstrated the Freightliner truck having the ten speed AutoSplit transmission at the July 14, 1995 Meeting. As part of these demonstrations, the attenders were given rides on the Freightliner truck and also were able to actually drive the truck.

9. From prior to July 27, 1995 to the filing date of the Genise '164 application on June 19, 1996, Thomas Genise and Ron Markyvech continuously worked on Eaton's AutoSplit/AutoShift/Top

Two automated transmission systems for commercial application. This work included supervising mechanical technician John Dresden III.

10. The '164 patent application was filed on June 19, 1996.

As discussed below, the Genise proofs demonstrate that Genise is prima facie entitled to priority relative to the Desautels et al '059 patent filing date of July 27, 1995 based on:

1. Actual reduction to practice in August, 1994, January 1995 and July 1995; and
2. Conception plus diligence from prior to July 27, 1995 to a constructive reduction to practice on June 19, 1996.

IX. STATEMENT OF FACTS

1. Since January of 1982, Thomas Genise has worked as an engineer for Eaton Corporation in the Corporate Research and Development - Detroit Center (CORD-DC) in the automated transmission development program for heavy duty vehicles. (Genise Affd. ¶3).

Since July 1976, Ron Markyvech has worked as an engineer for Eaton Corp. at CORD-DC in the automated transmission development program for heavy duty vehicles. (Markyvech Affd. ¶3).

Since 1990 James McReynolds has worked for Eaton Corporation at TACONA as the head of Product Planning and Strategic Planning for North America. (McReynolds Affd. ¶3).

2. In early 1993, McReynolds conceived of a partially-

automated transmission system which would be easier to drive than a manual transmission system, but which would be considerably less expensive than a fully automatic transmission system which does not contain a shift lever. (McReynolds Affd. ¶4). In conceiving the transmission system McReynolds realized that considerable expense is associated with eliminating the shift lever of a transmission system. McReynolds conceived of a partially automated transmission system which maintains the shift lever - thereby reducing the cost of the system - but which allows the driver to shift gears without disengaging the master clutch and without manipulating the throttle pedal. (McReynolds Affd. ¶4-5). On August 11, 1993, McReynolds faxed a specification-type document (Exhibit A) to Eaton's patent counsel, Howard D. Gordon. Exhibit A describes a partially automated transmission system which provides clutchless and throttleless shifting with a shift lever. The shift lever includes a switch at the top of the knob which when depressed causes the engine fueling to be controlled so as to minimize torque between the engine and the transmission thereby allowing the operator to shift into neutral. Thereafter, the system controlled the engine to achieve the synchronization speed of the next gear, allowing the operator to easily shift into the next gear.

3. Sometime in August 1993, McReynolds called Tom Genise to discuss the possibility of Genise developing the partially automated transmission system which McReynolds named "AutoStick".

(McReynolds Affd. ¶7). Specifically, McReynolds explained to Genise that the "AutoStick" transmission would include a shift lever, a shift button which the driver would depress in order to upshift or downshift. In response to depressing the button, the system would automatically control engine fueling to minimize torque, thereby allowing the driver to move the shift lever to neutral without using the clutch pedal, and after sensing neutral, the system would automatically control engine fueling to approach the synchronization speed for the next gear, thereby allowing the driver to move the shift lever to the next gear without manipulating the throttle. (McReynolds Affd. ¶8-9). On September 7, 1993, McReynolds faxed the specification-type document (Exhibit B) to Genise. (Genise Affd. ¶8).

4. Genise renamed AutoStick as "AutoSplit", and on November 15, 1993, Genise sketched on an electronic white board three options of how AutoSplit could be implemented during a meeting at CORD-DC (Genise Affd. ¶9). Exhibit C is a copy of those three sketches. Options 1, 2 and 3 show a manual transmission, a display unit for displaying the different gear ratios, an engine control unit for controlling the engine and a stick shift having a switch pad (options 1 and 3) or up/down buttons (options 2) for initiating the shift. Genise explained that in response to the driver depressing the switch pad or up/down buttons, the engine control unit controls engine fueling so as to reach a zero torque level,

thereby allowing the driver to move the shift lever to the neutral position. Genise further explained that after neutral was sensed, the engine control would control engine fueling to approach the synchronization speed for the next gear (Genise Affd. ¶9).

5. On December 9, 1993, Genise prepared a project proposal for a concept AutoSplit, called "Electronically Enhanced Super 10". Exhibit D is a copy of the December 9, 1993 proposal. Exhibit D includes several options for implementing AutoSplit including different versions of the intent-to-shift switch.

6. On May 13, 1994, Genise prepared with the assistance of W. M. Mack an "AutoSplit Specification for the Concept Prototype". Exhibit E is a copy of the specification which includes a description of the different engine control routines for the system. Specifically, section 5.5.4 of Exhibit E describes the "predip" mode during which the AutoSplit algorithm fuels the engine to provide zero driveline torque, and a "sync" mode which occurs when neutral is sensed and which commands the engine to approach the synchronization speed for the newly selected gear.

7. Between May 1994 and July 1995 Eaton's automated transmission program included, besides AutoSplit, related automated transmission projects under the names "AutoShift" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All three of these projects were transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using

engine controls without requiring the operator to utilize the clutch and/or throttle pedal. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All of these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). Specifically, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral, and after sensing neutral, automatically controlling the engine speed to approach the synchronous speed for the next expected gear. (Genise Affd. ¶24, Markyvech Affd. ¶19).

8. In May 1994, construction of a AutoSplit automated transmission prototype began. (Genise Affd. ¶11, Markyvech Affd. ¶6). Thomas Genise, Ron Markyvech and John Dresden III were the personnel at CORD-DC working on the AutoSplit project at this time (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Tom Genise was the system engineer for the AutoSplit project, Ron Markyvech was the software engineer for the project, and John Dresden III was the driver/mechanic for the project (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Exhibit 1 is a copy of a May 1994 project report prepared by Ron Markyvech and entitled "AUTOSPLIT CONCEPT PROTOTYPE" which included a general description of the AutoSplit transmission, and the work that was planned for the project. The project report shows that the object

of the project was to design and build a concept prototype transmission to demonstrate the AutoSplit concept.

9. In August of 1994, a prototype of the AutoSplit transmission system was completed and implemented in a ten speed Freightliner truck. (Genise Affd. ¶11, Markyvech Affd. ¶8, Dresden Affd. ¶6). This AutoSplit prototype was successfully tested during a three day extensive road trip between August 29-31, 1994. (Genise Affd. ¶11 and 13, Markyvech Affd. ¶8, Dresden Affd. ¶6). The three day trip originated from Southfield, Michigan and included stops at Marshall, Michigan and Traverse, Michigan. The test driving team included Tom Genise, Ron Markyvech and John Dresden III. (Genise Affd. ¶12, Markyvech Affd. ¶8, Dresden Affd. ¶6). Exhibit 2 is a copy of a August 1994 Project Report for the AutoSplit project which mentions the August 29-31, 1994 AutoSplit road trip. Exhibit 3 is a copy of Ron Markyvech's Travel and Business Expense Report for the August 29-31, 1994 road trip. At the top right hand corner of the Expense Report, there is an indication that the expenses occurred from August 29 to August 31, 1994. Towards the bottom half portion of the Expense Report next to the heading "Purpose of Trip:", there is the notation "Project #5956-01 AutoSplit Concept Transmission Development Road Trip". Project #5956-01 was the project number for the AutoSplit project. (Markyvech Affd. ¶9). In the section explaining the day by day expenditures, there is an indication that Ron Markyvech paid for

the meals of Tom Genise and John Dresden III.

10. The AutoSplit transmission system prototype that was successfully tested between August 29-31, 1994 was implemented in a Freightliner truck. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The Freightliner truck included an engine, an engine output shaft, an engine Electronic Control Unit (ECU) for controlling the engine speed and other engine parameters, a transmission ECU for controlling the engine ECU through a SAE J-1939 communication data link, a ten-speed transmission, a master clutch connected between the engine and the transmission, and a clutch pedal for controlling the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Exhibit 4 is a block diagram of the AutoSplit transmission system which was prepared by Ron Markyvech prior to January 1995, and is an accurate representation of the prototype tested between August 29-31, 1994. (Markyvech Affd. ¶10). Exhibit 4 shows a manual ten speed transmission, an engine control unit ECU2 connected to the engine via a J1939 data communication link input and output shaft sensors, a display unit for displaying the ten different gear ratios, and an intent-to-shift switch mounted on the shift lever and connected to the engine control unit.

11. The Freightliner truck also included transmission input and output shaft speed sensors, a manual stick shift for allowing the driver to manually shift the transmission between the ten

different speed ratios, a display panel mounted on the shift lever for displaying the presently engaged gear and the appropriate next gear, and a laptop computer which acted as an operator intent-to-shift control switch or button for sending a signal to the transmission ECU indicating whether an upshift or a downshift is to be initiated as the next gear shift, and for requesting that the engine be fueled to minimize driveline torque thereby allowing easy disengagement of an engaged ratio without requiring disengagement of the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

12. An upshift was initiated when the operator depressed keys of the keyboard of the laptop computer while an upshift was being displayed on the display, and a downshift was initiated when the operator depressed keys while a downshift was being displayed. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The operator intent to shift signal from the depressed keys of the keyboard initiated the upshift or the downshift by first signalling to the transmission ECU a desire to eliminate or minimize torque between the engine output shaft and the transmission output shaft. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Based upon receiving the operator intent to shift signal, the transmission ECU modified the engine fueling to reduce torque to the transmission without disengaging the master clutch. The operator could then easily shift the transmission to neutral.

(Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

13. Based upon receiving the intent to shift signal, and after sensing that the transmission was shifted to neutral, the transmission ECU then controlled the engine to achieve a determined engine speed necessary for the next gear ratio. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

14. Exhibits 5-11 are photocopies of photographs of the actual hardware elements used during the August 29-31, 1994 trip. Specifically, Exhibit 5 is a photograph of the actual ten-speed transmission used in the test. Exhibit 6 is a photograph of the actual transmission ECU, Exhibit 7 is a photograph of the actual engine and engine ECU, Exhibit 8 is a photograph of the actual electrical wiring harness, Exhibit 9 is a photograph of the actual display panel which was mounted on the shift lever, Exhibit 10 is a photograph of the actual master clutch foot pedal, and Exhibit 11 is a photograph of the actual truck used during the August 29-31, 1994 trip. (Genise Affd. ¶14, Markyvech Affd. ¶11, Dresden Affd. ¶8).

15. The AutoSplit transmission system tested during the August 29-31, 1994 trip included several software engine control routines. These software routines were implemented in the transmission ECU. (Genise Affd. ¶15, Markyvech Affd. ¶12). Exhibit 12 is a printout of the actual software code contained in the transmission ECU during the August 29-31, 1994 test trip. The

front page of Exhibit 12 identifies the dates of the various files contained in the software program, with the latest date being August 29, 1994. With the assistance of Tom Genise, Ron Markyvech wrote the software program of Exhibit 12 which is written in "C" computer language. (Genise Affd. ¶15, Markyvech Affd. ¶12).

16. One of the several software engine control routines of Exhibit 12 is able to predict or determine zero flywheel torque based on system variables, and then modify engine speed to achieve the zero torque condition. (Genise Affd. ¶16, Markyvech Affd. ¶13). The zero torque condition enables the driver to easily move the transmission out of gear engagement and into the neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶16, Markyvech Affd. ¶13). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶15, Markyvech Affd. ¶13). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine fueling such that a zero torque condition exists. (Genise Affd. ¶16, Markyvech Affd. ¶13). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶16, Markyvech Affd. ¶13). During the test road trip of August 29-31, 1994, the

laptop Personal Computer (PC) was connected to the communication data link of the AutoSplit system. (Genise Affd. ¶16, Markyvech Affd. ¶13). This allowed the PC to display the predicted torque percentage for achieving zero flywheel torque. (Genise Affd. ¶16, Markyvech Affd. ¶13). During testing on the road trip, function intent_final_pct_trq was commanded to equal the predicted torque percentage as well as other torque percentages. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the zero torque condition existed, the transmission was manually moved out of gear engagement and into a neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function determine_gear from module trns_act.c96 determined when the transmission moved to the neutral. (Genise Affd. ¶16, Markyvech Affd. ¶13).

17. The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to

be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

18. The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually

shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

19. During the August 29-31, 1994 road trip, the AutoSplit transmission system was extensively tested by monitoring data on the PC. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). In particular, the testing included monitoring the torque values after the intent-to-shift switch was recognized by the transmission ECU; monitoring when the transmission was shifted into neutral; monitoring and evaluating the various engine control parameters in different modes of operation (including the torque control mode and speed control mode); and monitoring the transmission input shaft speed. The testing also included evaluating data at the time the transmission shifted into gear and considering the "feel" of the shift for purposes of determining shift quality. (Genise Affd. ¶17 , Markyvech Affd. ¶14, Dresden Affd. ¶10).

20. The road trip of August 29-31, 1994 was considered successful by Genise, Dresden and Markyvech as the AutoSplit transmission system performed well throughout the testing, including successfully operating in the torque control mode and in the speed control mode, during various shift sequences. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). The results were reported in a Technical Report on February 21, 1995 which is discussed in connection with Exhibit 21.

21. During the development of the AutoSplit transmission system, Thomas Genise and Ron Markyvech periodically gave technical presentations to engineers at the Transmission Division of Eaton's Truck Components Operations North America (TCONA) regarding the development and operation of the AutoSplit transmission system. (Genise Affd. ¶18, Markyvech Affd. ¶15). These presentations often included a detailed discussion of the software code. (Genise Affd. ¶18, Markyvech Affd. ¶15). On September 29, 1994, Ron Markyvech went to TCONA in Galesburg, Michigan to give such a presentation. Exhibit 13 is a copy of an Expense Report dated September 30, 1994, that Ron Markyvech submitted in connection with the September 29, 1994 trip and presentation. The "Purpose of Trip" section of this Expense Report includes the statement: "Project #5956-01 went TCONA for software code walk through and technical presentation on the AutoSplit concept." (Markyvech Affd. ¶15).

22. The AutoSplit transmission prototype was subsequently demonstrated to engineers of Eaton's TCONA on January 11, 1995. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). Tom Genise and Ron Markyvech performed the demonstration. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The Eaton TCONA engineers that attended the demonstration included John Steeby and Warren

Dedow, and the structure and operation of AutoSplit were understood by Steeby and Dedow. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶6, Steeby Affd. ¶6). Exhibit 14 is a partial printout of Ron Markyvech's 1995 Personal log. The entry for January 11, 1995, indicates that Markyvech went to Marshall, Michigan and demonstrated the AutoSplit transmission system implemented in the Freightliner truck. During the September 12, 1994 and the January 11, 1995 demonstrations, John Steeby and Warren Dedow each drove the truck. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7, Steeby Affd. ¶7). The AutoSplit transmission prototype performed well during these demonstrations, operating in the torque control mode and in the speed control mode during various shift sequences providing clutchless and throttleless shifting for the multi-speed transmission. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7-9, Steeby Affd. ¶7-9).

23. The AutoSplit transmission system demonstrated on January 11, 1995 was basically the same system previously demonstrated on September 12, 1994 and tested during the road trip of August 29-31, 1994. (Genise Affd. ¶20, Markyvech Affd. ¶17). One difference between the systems concerned the shift display. In the system demonstrated on September 12, 1994 and tested between August 29-31, 1994, the top portion of the shift lever contained a display for displaying the currently engaged gear and the next gear (Genise Affd. ¶20, Markyvech Affd. ¶17; Exhibit 9). In the system

demonstrated on January 11, 1995, the display was re-configured as a separate device mounted on the truck's console. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 15 is a photocopy of the actual display used at the January 11, 1995 demonstration.

24. Another difference between the two systems concerned the shift lever. In the system demonstrated on September 12, 1994 and tested during August 29-31, 1994 trip, the driver intent-to-shift switch was not placed on the shift lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). During the August 29-31, 1994 trip, the intent-to-shift switch was the PC. The PC was connected to the system's communication data link and the intent-to-shift command was inputted by depressing keys on the keyboard of the PC. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). In the AutoSplit system demonstrated on January 11, 1995, a new shift lever was implemented which included an intent-to-shift switch or button on the lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 16 is a photocopy of the actual shift lever with the intent-to-shift button used during the January 11, 1995 demonstration. The intent to shift button was added to the shift lever on November 10, 1994 as indicated by the entry for this date in Ron Markyvech's log (Exhibit 17) .

25. There was also a modification to the software that was demonstrated on January 11, 1995. Exhibit 18 is a copy of the

software code implemented in the transmission ECU demonstrated on January 11, 1995. According to this code, function sequence_shift will call function shift_initiate which will set engine_commands to ENGINE_PREDIP which then calls function control_engine_predip to control automatically the engine torque parameter to zero as a function of predicted zero torque. (Genise Affd. ¶21, Markyvech Affd. ¶18).

26. A further demonstration of the Freightliner truck including the AutoShift system occurred on July 14, 1996 at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Thomas Genise described and demonstrated the AutoSplit transmission system on July 14, 1995 to engineers and upper management of Eaton Corporation. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Exhibit 19 is a Travel Expense Report that Genise submitted on July 17, 1995 for the travel he conducted the week of July 10, 1995. This travel included the July 14, 1995 demonstration trip. The "Purpose of Trip" section of the Report indicates that on July 14, 1995, Genise demonstrated the AutoSplit to TCONA management. Exhibit 19 also includes the Travel Expense Report of Ron Markyvech which indicates that he took the AutoSplit Concept Truck for the Automation Planning Meeting.

27. The AutoSplit transmission system demonstrated on July 14, 1995, included the same hardware components and operated according

to the same software structure described above in connection with the AutoSplit transmission system demonstrated on January 11, 1995. (Genise Affd. ¶23). The AutoSplit transmission system worked well during the demonstration performing clutchless and throttleless shifts and operating in the torque control mode and speed control mode during various shift sequences. Exhibit 20 is a memo from William A. Baken dated July 17, 1995 setting forth the "Automation Strategic Planning Meeting Minutes" for the July 14, 1995 meeting/demonstration. The third page of the memo indicates that Thomas Genise demonstrated the AutoSplit Concept Truck. Attached to the memo there is a copy of the Agenda for the July 14, 1995 meeting/demonstration. The Agenda indicates that ride and drive demonstrations were available at 7:00 am and 1:00 pm on July 14, 1995.

28. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Transmission prototype. (Genise Affd. ¶22). Exhibit 21 is a copy of the February 21, 1995 Technical Report which includes descriptions of the various control algorithms, and also provides plotted data of system parameters taken during actual vehicle shift testing.

29. Fig. 1 on page 5 of Exhibit 21 shows a block diagram of the AutoSplit system which includes a multi-speed transmission, an engine, an engine controller ECU2 connected to the engine via a J1939 communication data link, and a driver display for displaying

the presently engaged gear, and a possible or desirable upshifted/downshifted gear.

30. The "intent-to-shift" button - described on page 2 of Exhibit 21 - is located on the side of the shift lever and is operated by the driver's thumb. Exhibit 21 describes the software variable for zero driveline torque: needed_percent_for_zero_flywheel_trq. (Exhibit 21, ps. 13-14). This variable is requested via the engine communication data link J1939 by the engine controller (Exhibit 21, p. 12).

31. The AutoSplit Technical Report was signed and approved by Eugene Braun, and was widely distributed throughout Eaton Corporation. The individuals receiving the AutoSplit Technical Report included Ron Markyvech, Jon Steeby, Warren Dedow, Steve Edelen and Marcel Amsallen (Exhibit 21, cover page).

32. As indicated, during the period of time from the beginning of July 1995 through the end of June 1996, the automated transmission program of Eaton Corporation included related projects under the names "AutoShift", "AutoSplit" and "Top Two". During this time period, continuous efforts were made to develop these related projects so as to provide commercially viable transmission systems. (Genise Affd. ¶24 , Markyvech Affd. ¶19).

33. These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to

utilize the clutch and/or throttle pedal, thereby assisting the driver with the shift sequence. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral from a gear to be disengaged, and to achieve engine synchronization speed for clutchless engaging a target gear ratio. (Genise Affd. ¶24, Markyvech Affd. ¶19).

34. During the period of time from the beginning of July 1995 through the end of June 1996, Thomas Genise, along with Ron Markyvech under Genise's supervision continuously worked on developing products for heavy duty trucks in Eaton's automated transmission program. (Genise Affd. ¶24-30, Markyvech Affd. ¶19).

35. Exhibit 22 includes the time sheets for Ron Markyvech, Tom Genise and John Dresden III between July 1995 and June 1996. As indicated in the table below, the majority of Genise's and Markyvech's time, for each month between July 1995 and June 1996, was spent on developing products for the AutoShift/AutoSplit/Top-Two automated transmission projects.

Ron Markyvech

July '95	83.5 hours
August '95	109.5 hours
Sept. '95	133.0 hours
Oct. '95	169.0 hours
Nov. '95	137.0 hours
Dec. '95	83.5 hours
Jan. '96	101.5 hours
Feb. '96	90.0 hours
Mar. '96	121.0 hours
Apr. '96	121.0 hours
May '96	131.5 hours
June '96	81.0 hours
Total	1,361.5 hours

Tom Genise	
July '95	111.0 hours
Aug. '95	108.5 hours
Sept. '95	111.0 hours
Oct. '95	159.5 hours
Nov. '95	162.5 hours
Dec. '95	121.0 hours
Jan. '96	172.5 hours
Feb. '96	135.5 hours
Mar. '96	119.0 hours
Apr. '96	95.5 hours
May '96	80.5 hours
June '96	110.5 hours
Total	1,487 hours

36. Exhibit 23 includes Markyvech's personal logs for 1995 and 1996. These logs detail his work activity on a daily basis for 1995 and 1996. Exhibit 24 is a collection of Genise's monthly reports for the period between July 1995 and June 1996 as well as Genise's Travel Expense Reports during this period. Below is a summary of Genise's and Markyvech's product development activities between July 1995 and June 1996 relating to Eaton's AutoSplit/AutoShift/Top Two automated transmission projects.

37. In July 1995, Tom Genise and Ron Markyvech worked on the AutoShift and AutoSplit automated transmission projects. On July 12, 1995, Tom Genise travelled to Galesburg, Michigan to attend a J1939 data communication link meeting. Markyvech's personal log (Exhibit 23) and July 1995 Monthly Report indicate that towards the end of July, Markyvech worked on the transmission manager code for the AutoShift 7-speed transmission project.

38. Throughout August 1995, Markyvech worked on development of the 7 speed AutoShift project. This work included identifying a problem with the reverse gear switch. Specifically, on August 28, 1995, Markyvech uncovered that the reverse gear switch would give a mismatch when trying to engage low gear. This mismatch problem was caused because software function "x_outside_offset" was too small. On August 22, 1995, Genise prepared a Functional Performance Specification for the AutoSplit project (Exhibit 25). On August 30, 1995, Genise distributed an AutoSplit Design Specification sheet (Exhibit 26). Exhibit states that "TACONA has identified the AutoSplit transmission concept as an integral part of their automatic product strategy".

39. On September 29, 1995, Genise travelled to Galesburg, Michigan to attend an automation team meeting. On September 30, 1995, Genise prepared Revision 1.0 of the AutoSplit Product Design Specification (Exhibit 27). In September 1995, Markyvech worked on the AutoSplit and AutoShift transmission projects. On September

11, 1995, Markyvech stripped the AutoSplit wire harness out of a test vehicle for use in the 7 speed AutoShift test vehicle. Much of the remainder of the month was spent installing and testing the vehicle interface wiring. Markyvech's September 1995 Report for the 7 speed AutoShift details the accomplishments for the month including modification of the base AutoShift software, testing the Freightliner vehicle wire harness, modifying the four rail shift bar housing, installing the transmission in a truck, and starting initial system debugging.

40. In October 1995, Markyvech spent most of his time working on the 7 speed AutoShift vehicle software. Markyvech's October 1995 Report for the 7 Speed Autoshift details the accomplishments for the month which includes modifying the software to account for the varying step sizes of the seven speed transmission, and modifying the software to include the capability of adjusting the upshift point based on the target gear. On October 12, 1995, Genise travelled to Milford, Michigan to grade test the AutoShift transmission system. On October 30, 1995, Genise prepared a Design Specification (Exhibit 28) which indicates that revisions to the AutoSplit development will be continued under another project. Genise also prepared on October 30, 1995, a revised AutoSplit Design Specification (Genise Affd. ¶24; Exhibit 29).

41. Between November 1-3, 1995, Genise travelled through northern Michigan test driving the AutoShift transmission system.

On November 17, 1995, Genise prepared a revised Functional Performance Specification for the AutoSplit project (Exhibit 30). On November 13 and 28, 1995, Genise travelled to Galesburg and Southfield, respectively, test driving the AutoShift transmission. On November 22, 1995, Genise traveled to Traverse City, Michigan, test driving the 7 speed AutoShift system. In November 1995, Markyvech continued work on the 7 speed Autoshift project. On November 21, 1995, Markyvech wrote a miles/hour - function MI_PER_HOUR - reading software routine for the AutoShift, and bench tested the routine. On November 28, 1995, Markyvech tested the AutoShift truck to obtain acceleration data. Markyvech's November 1995 Report for the Autoshift 7-Speed Prototype indicates the accomplishments for the month as including testing the vehicle, and demonstrating the vehicle on November 11, 1995. In November Markyvech also started work on the Top Two project. On November 13, 1995, Markyvech went to Galesburg, Michigan to pick up the Top Two truck that was to be used for evaluation purposes.

42. On December 5, 1995, Genise travelled to Marshall, Michigan test driving the Top 2 truck. On December 20, 1995, Genise travelled to Galesburg, Michigan, for a demonstration of the AutoShift transmission system. In December 1995, Markyvech started working on the performance code for the 10 speed AutoShift. On December 11, 1995, Markyvech tested the performance code for the 10 speed AutoShift. On December 21, 1995, Markyvech tested the 10

speed Autoshift in different performance modes of operation. Markyvech's December 1995 Report indicates that the accomplishments for the month included installing and testing various software code for allowing the engine to upshift at higher engine RPMs, for adding an additional 400 RPMs to the deceleration rate of the engine during upshifts, for allowing double upshifts, and for using the engine compressing brake when doing skip shifting.

43. Genise and Markyvech spent much of January 1996 developing a skip shiftability function for the AutoShift transmission system. On January 31, 1996, the skip shiftability feature was demonstrated to Marcel Amsallen of Eaton Corporations' Truck Component Operation North Americas (TCONA) in Galesburg, Michigan. On January 16, 1996, Genise travelled to Milford, Michigan, test driving the AutoShift. On January 31, 1996, Genise travelled to Galesburg, Michigan to demonstrate the AutoShift software and to meet with TCONA people. Genise's January 1996 Monthly Report states that during this month, the AutoShift Shift algorithm was modified to include skip shifting, and was made more adaptive to actual engine braking effectiveness. Markyvech also attended a meeting on January 11 at TCONA in connection with the Top-Two project. Markyvech's January 1996 Report indicates that the skip shift algorithms were developed, and that an adaptive algorithm that monitors the turn off delay of the engine compression brake used on skip upshifts was incorporated into the

software.

44. Genise's February 1996 Monthly Report indicates that on February 7, 1996, the modified AutoShift software that included skip shifting was demonstrated. Further, during this month, a task was added to evaluate a modified pneumatic inertia brake used to speed up shifting, and test software was written that allows the AutoShift truck to be used as the stationary test stand. On February 27, 1996, Genise travelled to Calamus, Michigan to attend a Top 2 team product development meeting. In February, 1996, Markyvech worked on the Top 2 project which was implemented in a Mack truck. Markyvech also continued work on the AutoShift project. On February 15, 1996, Markyvech worked on getting his laptop computer to run the ENG2 diagnostic software. On February 26, 1996, Markyvech worked on AutoShift truck-as-test-stand code. Markyvech's February 1996 AutoShift Support Report indicates that test software was written that allows the AutoShift truck to be used as a stationary test stand. Markyvech's February 1996 Report entitled "Top Two Continued Support" indicates that accomplishments for February 1996 included receiving software and hardware packages for testing and evaluation, and implementing engine controller ENG2 diagnostic software on a desk top PC.

45. Genise's March 1996 Monthly Report - which mistakenly states that it is for the month of February - indicates that on March 26, 1996, a meeting was held to discuss a method of routing

pressurized oil from the transmission internal oil pump. The Report also indicates that during March 1996, software regarding the SEL_GEAR module was written, incorporated into the Mack system and tested. Genise's March 1996 report entitled "AutoShift Support" also mentions the oil routing method for the AutoShift transmission. On March 29, 1996, Genise travelled to Dearborn, Michigan to obtain hardware for the Volvo AutoSplit Truck. Much of Genise's work in March 1996 was spent working on software for the Top Two project. This included work on the select gear module SEL_GEAR on March 14, 15 and 21. Markyvech's March 1996 Report entitled "Mack Top Two Concept Prototype" indicates that the accomplishments for March 1996 included writing and incorporating the SEL_GEAR module. Further, a competitive comparison was prepared for the Mack system versus the AutoShift system. In addition, at the end of March Markyvech worked on the AutoSplit project. Specifically, on March 28-30, Markyvech worked on installing a wiring harness for an AutoSplit system in a test vehicle.

46. Genise's April 1996 Report indicates that during this month an AutoSplit system was installed in a Volvo truck. Genise's April 1996 Report entitled AutoShift Support indicates that a new test was prepared that uses the integral oil pump in the transmission. In the beginning of April 1996, Markyvech worked on installing the AutoSplit wiring harness. On April 22, Markyvech worked on the torque transducer software/calibration. Markyvech

also worked on the Mack Top Two towards the end of April. Markyvech's April 1996 Report entitled MACK TOP TWO CONCEPT PROTOTYPE indicates that during April 1996 software coding efforts continued. Markyvech's April 1996 Report entitled "Volvo AutoSplit Retrofit" indicates that the AutoSplit system was installed in a new Volvo vehicle that was supplied to TCONA, and that repairs were made to the wiring harness during the installation.

47. Genise's May 1996 Monthly Report indicates that approximately 80 percent of the software code needed for the Mack Top Two has been designed, written, compiled and integrated into the bench top system. On May 16, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. On May 22, 1996, Genise made a trip to Mack Truck, Inc. to discuss the Top 2 project. On May 15, Genise prepared a document entitled "Volvo AutoSplit RetroFit" (exhibit). The purpose of this document was to document the efforts on installing the AutoSplit transmission system in a vehicle for demonstration and evaluation purposes. On May 28, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. Further, Genise's May 1996 Report entitled "AutoShift Support" indicates that during this month plans were being made with TCONA to continue testing and development of 25 AutoShift units. Markyvech spent most of his time in May 1996 working on the Mack Top Two. On May 8, 1996, Markyvech performed tests regarding output shaft speed acceleration. On May 14,

Markyvech worked on debugging the skid detection routine. Towards the end of May, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. Markyvech's May 1996 Report entitled "Mack Top Two Concept Prototype" indicates that work continued on the software code, and by May 1996 approximately 4.4K bytes of code had been written. Further, the Report indicates work on testing and debugging of the Top Two software modules.

48. Genise's June 1996 Monthly Report indicates that development on the AutoShift system continued. On June 13, 1996, Markyvech travelled to Southfield, Michigan to obtain supplies for the AutoSplit installation. On June 18, 1996, Genise travelled to Warren, Michigan, in connection with the AutoSplit truck. On July 1, 1996, Genise travelled to Marshall proving grounds for an AutoSplit demonstration. In the beginning of June 1996, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. On June 10, Markyvech worked on the resync portion of the Mack Top Two software code. Markyvech's June 1996 Report entitled "Mack Top Two Concept Prototype" indicates that initial software was approximately 90 percent complete. During the last two weeks of June, Markyvech worked on installing the AutoSplit in a new vehicle for purposes of testing and evaluation. Markyvech's June 1996 Report entitled "AutoSplit Continued Development" also discusses the AutoSplit transmission installation.

X. DISCUSSION

A. Genise Is Entitled To Priority Based On (1) Actual Reduction To Practice Prior To The Filing Date of the Desautels et al '059 Patent And (2) Conception Plus Diligence To Constructive Reduction To Practice

1. Law Of Actual Reduction To Practice

In order to demonstrate an actual reduction to practice for purposes of showing priority in an interference, the device or process must include every essential limitation of the count. Correge v. Murphy, 217 USPQ 753 (Fed. Cir. 1983). Further, the reduction to practice must show the practical usefulness of the invention. Symmes v. King 21 USPQ 2d 1462 (Fed. Cir. 1991).

In the present case there were multiple reductions to practice of the invention. Specifically, reduction to practices occurred in August 1994, January 1995 and July 1995.

Applicant is submitting herewith the Affidavits of Thomas A. Genise, Ronald K. Markyvech and John Dresden III. These individuals developed, built and tested the AutoSplit automated transmission system. (Genise Affd. ¶11-12, Markyvech Affd. ¶5-8, Dresden Affd. ¶5-7). These Affidavits together with the attached documentary evidence establish that the AutoSplit transmission system was implemented in a Freightliner truck having a ten speed transmission, and that the Freightliner truck having the ten speed AutoSplit transmission successfully completed a three day road test between August 29-31, 1994. (Genise Affd. ¶13, Markyvech Affd. ¶8, Dresden Affd. ¶6). Further, these Affidavits establish that the Freightliner truck having the AutoSplit transmission was

successfully demonstrated on January 11, 1995 and July 14, 1995 to engineers of Eaton Corporation's Corporate Research & Development-Detroit Center and of Eaton's Transmission Division. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18).

Applicant is also submitting the Affidavits and attendant documentary evidence of Jon Steeby, Steven Edelen and Warren Dedow. Steeby, Edelen and Dedow were all familiar with the AutoSplit transmission hardware and software. (Edelen ¶7-8, Dedow Affd. ¶6). Steeby and Dedow attended the demonstration on January 11, 1995 during which they drove the Freightliner truck containing the AutoSplit transmission system. (Steeby Affd. ¶7, Dedow Affd. ¶7). Edelen and Steeby attended the demonstration on July 14, 1995. (Edelen Affd. ¶8 and Steeby Affd. ¶5).

The affidavits and accompanying documents submitted herewith demonstrate that the AutoSplit transmission system was an operable working transmission system on August 29-31, on January 11, 1995, and on July 14, 1995 - all of which are prior to the July 27, 1995 filing date of the Desautels et al '059 patent. These Affidavits and accompanying documents also establish that the AutoSplit transmission system prototype included every limitation recited in the proposed Counts 1 and 2.

Specifically, the Affidavits and documentary evidence

establish that the Freightliner truck with the 10 speed AutoSplit transmission demonstrated on August 29-31, 1994, on January 11, 1995, and on July 27, 1995 each contained: an engine having an output shaft; a multi-speed transmission connected to the engine output shaft; an engine control to control engine fueling of the engine; and an operator input for allowing the operator to signal a desire to eliminate torque between the engine and the transmission (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-8, Edelen Affd. ¶8-11, Dedow Affd. ¶7-8). The evidence also indicates that the engine control determined a zero torque fuel parameter value for the engine that approximated a zero torque load on the connection between the engine and the transmission; that the engine control operated to control the engine fueling to achieve the zero torque parameter value; and that after the zero torque fuel parameter value was obtained, the transmission was manually moved out of engagement to a neutral position (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-9, Edelen Affd. ¶8-13, Dedow Affd. ¶7-9). Specifically, the software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The function "control_intent_to_shift" and

the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine speed such that a zero torque condition exists. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module

drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The evidence demonstrating the reduction to practice of the AutoSplit is summarized below in table form.

COUNT 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**

A vehicle drive comprising:	Exhibits 5-11 show the vehicle drive of the AutoSplit system.
an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;	Exhibit 7 shows an engine having an output shaft. Exhibit 6 shows the engine control which controls the output speed of the engine output shaft (Genise Affd. ¶13, Markyvech Affd. ¶10)
a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;	Exhibit 5 shows a multi-speed (ten) selectively connected to the engine output shaft and operable to convert drive from the engine output shaft through several speed ratios.
a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and	Exhibit 10 shows the master clutch foot pedal which selectively activates the clutch positioned between the engine and the transmission.

an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit of whether an upshift or a downshift is to be initiated, and further providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.	Exhibit 16 shows intent-to-shift button for the operator. Exhibit 12 is the software code contained in the electronic control unit. The functions control_intent_to_shift and intent_final_pct-trq modify engine fueling to provide a zero torque condition in response to the intent-to-shift button. The function get_automatic_gear determines whether an upshift or a downshift is to be expected as the next shift, and calculates the speed ratio at the next expected gear. The function control_engine_sync was used to control engine sync. speed for the next gear. In order to determine the sync. speed for the next gear, function desired_engine_speed was used (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14).

Count 2	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
A method of operating a vehicle comprising the steps of:	The AutoSplit transmission system provided a method of operating a vehicle.

Count 2	AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)
a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission,	Exhibit 7 shows an engine having an output shaft. Exhibit 6 shows the engine control which controls the output speed of the engine output shaft (Genise Affd. ¶ 13, Markyvech Affd. ¶ 10). Exhibit 5 shows a multi-speed (ten) selectively connected to the engine output shaft and operable to convert drive from the engine output shaft through several speed ratios. Exhibit 10 shows the master clutch foot pedal which selectively activates the clutch positioned between the engine and the transmission.

Count 2	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
and an operator input switch system allowing an operator to provide an indication to said electronic control unit of when an upshift or a downshift is to be expected as the next shift, and further providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;	Exhibit 16 shows intent-to-shift button for the operator. Exhibit 12 is the software code contained in the electronic control unit. The functions control_intent_to_shift and intent_final_pct_trq modify engine fueling to provide a zero torque condition in response to the intent-to-shift button. The function get_automatic_gear determines whether an upshift or a downshift is to be expected as the next shift, and calculates the speed ratio at the next expected gear. The function control_engine_snyc was used to control engine sync. speed for the next gear. In order to determine the sync. speed for the next gear, function desired_engine_speed was used (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14).
b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;	Upshift/downshift was initiated when the intent-to-shift switch was depressed while an upshift/downshift was displayed on the display (Genise Affd. ¶ 13-17), Markyvech Affd. ¶ 10-14).
c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;	Based upon receiving the intent-to-shift signal, the ECU controlled the engine to achieve the speed necessary for the next gear ratio (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14).

Count 2	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
d. providing a torque elimination request from said operator switch;	In response to depression of the intent-to-shift switch, torque is eliminated (Markyvech Affd. ¶ 13-17, Genise Affd. ¶ 10-14).
e. controlling an engine parameter to reduce the torque load from said engine on said transmission;	Function intent_final_pct_trq of Exhibit 12 controls engine fueling to reduce torque from engine to the transmission.
f. manually moving said transmission to neutral;	The shift lever manually moved to neutral when zero torque condition is achieved (Markyvech Affd. ¶ 13-17, Genise Affd. ¶ 10-14, Dresden Affd. ¶ 7).
g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and	Function desired_engine_speed of Exhibit 12 moved the engine output speed to the desired engine speed.
h. engaging said transmission in said next selected gear.	When substantial sync. speed was achieved, the shift lever was moved to the next gear (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14, Dresden Affd. ¶ 7-10).

The foregoing clearly establishes an actual reduction to practice of the invention defined in proposed Counts 1 and 2 on August 29-31, 1994, on February 11, 1995 and on July 14, 1995.

2. Conception

As set forth in Mergenthaler v. Scudder, 11 App. D.C. 264, 1897 C.D. 724:

> The conception of the invention consists in the complete performance of the mental part of the inventive act. All that remains to be accomplished in order to perfect the act or instrument belongs to the department of construction, not invention. It is, therefore, the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice that constitutes an available conception within the meaning of the patent law.

See also, Coleman v. Dines, 224 USPQ 857 (Fed. Cir. 1985) and Oka v. Youssefyeh, 7 USPQ2d 1169 (Fed. Cir. 1988).

The facts of record indicate a conception of the invention in 1993. A written description of the invention in proposed Counts 1 and 2 are set forth in the Specification-type document (Exhibit A) Genise's presentation materials (Exhibit B), Genise's project proposal (Exhibit C), Genise's specification (Exhibit D), the software code printouts (Exhibits 12 and 18) and the Technical Report (Exhibit 21) - all of which are prior to July 27, 1995 - the filing date of the '059 patent. For purposes of simplifying the analysis, the Technical Report (Exhibit 21) entitled "AutoSplit truck Transmission Concept Prototype" dated February 21, 1995 will be compared relative to the elements/steps of proposed Counts 1 and 2 to demonstrate a conception prior to the '059 patent's filing date of July 27, 1995. This report was approved by Eugene Braun, Genise's supervisor (Exhibit 21, cover page), and was widely distributed to numerous engineers and management personnel at Eaton Corporation (Exhibit 21; Genise Affd. ¶22). Set forth below is the comparison of the elements/steps of proposed Counts 1 and 2 and the

February 21, 1995 Technical Report (Exhibit 21).

COUNT 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A vehicle drive comprising:	Exhibit 21 - Abstract describes a vehicle drive.
an engine having an output shaft and an electronic control unit for controlling the output speed of said engine output shaft;	Exhibit 21 - page 5 shows a J1939 data communication line connected "To Engine" which inherently includes an output shaft.Exhibit - page 5 shows an engine controller ECU 2 for controlling an engine speed of the engine output shaft via data communication link J1939.
a multi-speed transmission, said multi-speed transmission being selectively connected to said engine output shaft and operable to convert drive from said engine output shaft through several speed ratios to an output speed on a transmission output shaft;	Exhibit 21 - page 5 shows a ten-speed Transmission which is connected to the engine output shaft. The transmission depicted includes an output shaft.
a clutch that may be selectively actuated by an operator, said clutch positioned between said engine and said transmission; and	Exhibit 21 - pages 6-7 describes the operation of a "manual conventional clutch" for eliminating torque between the engine and the transmission. Page 7 states that the clutch may be selectively actuated by the operator.

COUNT 1	February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)
an input control for an operator, said input control allowing an operator to provide an indication to said electronic control unit of whether an upshift or a downshift is to be initiated, and further providing the operator the ability to request torque elimination during this shift, said electronic control unit being operable to receive signals from said input control, and determine a desired engine speed at the next gear ratio based upon said operator indication, and to control said engine to achieve said desired engine speed, and said electronic control unit further being operable to modify an engine parameter to achieve reduced torque transmission to said transmission to allow an operator to move said transmission to a neutral position when a signal requesting torque elimination is received from said input control.	Pages 2 and 12 of Exhibit 21 describe the "intent-to-shift" operator control button on the shift knob for initiating defueling of the engine to eliminate torque between the engine and the transmission. Pages 12-14 of Exhibit describe the zero torque driveline torque software control algorithm which is performed in response to the operator intent-to-shift button Page 6 indicates that when the operator depresses the intent-to-shift under conditions that lever shift is allowed (when the display indicates that either an upshift or a down shift is possible - page 4), the engine controller will initiate engine control and shifting into neutral by the operator can be obtained.

Count 2	February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)
A method of operating a vehicle comprising the steps of:	Exhibit 21 - Abstract describes a vehicle drive.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
a. providing a vehicle drive including an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, a multi-speed transmission selectably driven by said engine output shaft, said multi-speed transmission being operable to be moved between several speed ratios to control the ratio between an output speed on an output shaft of said transmission and the speed of said engine output shaft, a clutch disposed between said engine output shaft and said transmission to allow a elimination of drive from said engine to said transmission, and an operator input switch system allowing an operator to provide an indication to	Exhibit 21 - page 5 shows a J1939 data communication line connected "To Engine" which inherently includes an output shaft.Exhibit - page 5 shows an engine controller ECU 2 for controlling an engine speed of the engine output shaft via data communication link J1939. Exhibit 21 - page 5 shows a ten-speed Transmission which is connected to the engine output shaft. The transmission depicted includes an output shaft. Exhibit - page 7 describes the operation of a conventional clutch for eliminating torque between the engine and the transmission. Page 7 states that the clutch may be selectively actuated by the operator.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
said electronic control unit of when an upshift or a downshift is to be expected as the next shift, and further providing the operator the ability to request torque elimination from said electronic control unit such that the transmission may be moved to neutral without actuating said clutch;	Pages 2 and 12 of Exhibit 21 describes the "intent-to-shift" operator control button on the shift knob for initiating defueling of the engine to eliminate torque between the engine and the transmission. Pages 12-14 of Exhibit describe the zero torque driveline torque software control algorithm which is performed in response to the operator intent-to-shift button Page 6 indicates that when the operator depresses the intent-to-shift under conditions that lever shift is allowed (when the display displays indicates that either an upshift or a down shift is possible - page 4), the engine controller will initiate engine control and shifting into neutral can be obtained by the driver.
b. providing an indication to said electronic control unit of whether an upshift or a downshift is expected as the next gear shift;	Exhibit 21 - Pages 6, 8 and 9 describe, and Figs. 2 and 3 show that the electronic control unit ECU is provided an indication of whether an upshift or a downshift is expected as the next gear shift.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
c. identifying a desired engine speed at the next expected gear ratio based upon said driver input of whether an upshift or a downshift is next expected;	Exhibit 21 - Page 6 indicates that when the operator depresses the intent-to-shift under conditions that lever shift is allowed (when the display indicates that either an upshift or a down shift is possible - page 4), the engine controller will initiate engine control. Page 6 describes that for lever shifts, the system commands the engine to go to the speed for synchronous of the next gear.
d. providing a torque elimination request from said operator switch;	Page 6 indicates that when the operator depresses the intent-to-shift the engine controller will initiate engine control to eliminate or reduce torque.
e. controlling an engine parameter to reduce the torque load from said engine on said transmission;	Pages 12-14 of Exhibit 21 describe the zero torque driveline torque software control algorithm which is performed in response to the operator intent-to-shift button.
f. manually moving said transmission to neutral;	Exhibit 21 - Page 7 describes the operation of a conventional clutch for eliminating torque between the engine and the transmission thereby allowing the operator to move the transmission from an engaged gear to neutral.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
g. using said electronic control unit to begin moving said engine output speed to said desired engine speed; and	Exhibit 21 - Page 6 describes that for lever shifts, the system commands the engine to go to the speed for synchronous of the next gear.
h. engaging said transmission in said next selected gear.	Exhibit 21 - Page 6 indicates that after the synchronous speed for the next gear is obtained, the driver moves the lever to the next gear position.

As is apparent, the February 21, 1995 Technical Report entitled "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21) clearly includes every feature set forth in proposed Counts 1 and 2, and therefore constitutes a complete conception of the invention.

3. Diligence

Diligence consists of activity directed toward reduction to practice of an invention or overcoming obstacles to reduction to practice. Diligence must be shown during the "critical period", i.e., from just before entry of the rival inventor into the field, to actual or constructive reduction to practice. Moller v. Harding, 214 USPQ 724 (Bd. Pat. Int. 1982). During the critical period there must be "reasonably continuous activity". Burns v. Curtis, 80 USPQ 587 (CCPA 1949).

In the present case the critical period begins just before July 27, 1995, the filing date of the Desautels et al '059 patent. It ends with Genise's constructive reduction to practice on June 19, 1996, the date the subject application was filed in the Patent Office. The facts of record show continuous diligence during this critical period.

During the period of time from the beginning of July 1995 through the end of June 1996, Eaton Corporation Corporate Research & Development Center in Detroit, Michigan (CORD-DC) had an automated transmission development program for heavy duty vehicles. (Genise Affd. ¶24, Markyvech Affd. ¶19). Eaton's automated transmission program included related projects under the names "AutoShift","AutoSplit" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶19). These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal (Genise Affd. ¶24, Markyvech Affd. ¶19). Each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

In the present case, the record shows that Genise and Markyvech - under the supervision of Genise - continuously worked during the critical period on implementing the invention defined by

proposed Counts 1 and 2 in a heavy duty truck driveline. Besides supervising Markyvech in connection with the transmission automation projects, Genise designed the system and software requirements including algorithm design, and determined system requirements. (Genise Affd. ¶24-30). In addition, Genise prepared specification requirements, project/program plans, and technical reports in connection with the automated transmission program. (Genise Affd. ¶24-30). Markyvech's work concentrated primarily on software development and testing. (Markyvech Affd. ¶4 and 19). However, Markyvech also developed and tested the electrical system needed for communicating between the engine Electronic Control Unit (ECU), the transmission ECU and the various system sensors, including the input and output shaft speed sensors. (Markyvech Affd. ¶4 and 19). Markyvech also tested the J1939 data communication link between the engine and transmission ECUs. (Markyvech Affd. ¶4 and 19). Further, the record shows that John Dresden III, under the supervision of both Genise and Markyvech built transmissions, assembled prototypes from stock transmissions, built and installed electrical and mechanical transmission components, such as hoses, sensors, brackets, ECUs, and tested transmissions including recording and obtaining data. (Dresden Affd. ¶4-5). The time records for Genise, Markyvech and Dresden show continuous work on developing the AutoSplit/AutoShift/Top Two transmission systems (Exhibit 22):

Cumulative Time For Genise, Markyvech and Dresden Between July 1995-June 1996	
July '95	194.5 hours
Aug. '95	285.5 hours
Sept. '95	329.0 hours
Oct. '95	375.0 hours
Nov. '95	364.5 hours
Dec. '95	233.5 hours
Jan. '96	286.5 hours
Feb. '96	261.5 hours
Mar. '96	284.5 hours
Apr. '96	258.0 hours
May '96	274.0 hours
June '96	219.5 hours
Total	3,366.0 hours

All of the above show continuous diligence with respect to developing a product implementing the present invention well before July 27, 1995, and continuing past June 19, 1996.

4. Corroboration

Corroboration consists of a rule of reason determination of whether the evidence as a whole supports the claimed invention. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). The purpose of the

corroboration requirement is to prevent fraud. Velsicol Chemical Corp. v. Monsanto Co., 579 F.2d 1038 (7th Cir. 1978). Evidence corroborating priority may be documentary or oral. Bell Telephone Laboratories v. Hughes Aircraft Co., 565 F.2d 654, 657 (3d Cir. 1977), cert. denied 435 U.S. 924 (1978). In determining whether evidence of an invention has been sufficiently corroborated, courts apply a rule of reason approach, performing a reasonable analysis of the total evidence. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). Corroboration therefore turns on the facts when viewed as a whole. Moreover, corroborative evidence need not consist of an actual witnessing of the reduction to practice -- circumstantial evidence alone can satisfy the corroboration requirement. Id. at 776.

In the present case, the reduction to practice of the invention between August 29-31, 1994 is corroborated by Dresden. The reductions to practice on January 11, 1995 is corroborated by Steeby and Dedow. The reduction to practice on July 14, 1995 is corroborated by Steeby and Edelen, as well as by the later document prepared by William Batten which provides the minutes of the July 14, 1995 transmission automation meeting. The August 1994 and January 1995 reductions to practice are also corroborated by documents including the February 21, 1995 Technical Report for the AutoSplit Truck Transmission which indicates that the AutoSplit transmission system was successfully tested and demonstrated.

(Exhibit 21).

Exhibit 21 provides a conception of the invention which is corroborated by Dedow, Edelen and Steeby. Each of these individuals received a copy of Genise's February 21, 1995 Technical Report detailing the invention defined in Counts 1 and 2.

XI. CONCLUSION

The evidence of record proves prima facie that Genise is entitled to priority relative to the July 27, 1995 filing date of the Desautels et al '059 patent based on :

(a) prior reduction to practices of the subject matter defined in proposed Counts 1 and 2 on August 29-31, 1994, January 11, 1995 and July 14, 1995; and

(b) prior conception plus diligence to the constructive reduction to practice date of June 19, 1996 (the filing date of the subject application).

Accordingly, the Examiner is respectfully requested to declare an interference between U.S. Patent No. 5,571,059 and the present application No. 08/666,164 pursuant to Applicant's Request under 37 CFR §1.607(a).

Respectfully submitted,

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Date: August 29, 1997

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

THOMAS A. GENISE

#13

Application No: 08/666,164 Group Art Unit: 3502

Filed: June 19, 1996 Examiner: T. Kwon

For: AUTOMATED TRANSMISSION SYSTEM CONTROL WITH ZERO ENGINE FLYWHEEL TORQUE DETERMINATION

THIRD REQUEST FOR INTERFERENCE PURSUANT TO 37 C.F.R. § 1.607

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I. INTRODUCTION

Applicant hereby requests the declaration of an interference between this application Serial No. 08/666,164 to Genise ("Genise '164 application") and U.S. Patent No. 5,569,115 to Desautels et al ("Desautels '115 patent"). This request for interference is made in accordance with the provisions of 37 CFR §§ 1.607 and 1.608, and as specified therein sets forth among other things: (1) Counts for the Interference; (2) a showing that the Desautels '115 patent contains claims that correspond to the Counts; (3) a showing that the Genise '164 application contains claims that correspond to the Counts; and (4) a detailed explanation of Genise's right to priority, supported by Declarations and documentary evidence.

II. THE SUBJECT MATTER IN ISSUE

The subject matter of this potential interference deals with an engine synchronization system for assisting an operator in manually shifting a multi-speed transmission. The system includes an operator intent to shift switch for indicating that a particular shift is to be expected. Once the transmission is moved to neutral, the control unit determines the engine speed necessary to achieve a synchronized shift to the next speed ratio by multiplying the speed ratio at the next expected gear with the current transmission output speed. The engine is then controlled to achieve the determined engine speed so that the operator can manually shift the transmission to the next gear.

III. THE INVOLVED PATENT AND APPLICATION

U.S. Patent No. 5,569,115 ("the Desautels et al '115 patent") issued to Desautels et al on October 29, 1996.

The present application U.S. Appln. No. 08/666,164 to Thomas A. Genise (The Genise '164 application) was filed on June 19, 1996. By the Amendment filed concurrently herewith, Applicant has amended the specification to indicate that the Genise '164 application is a continuation application of U.S. Appln. Nos. 08/649,830, 08/649,831 and 08/649,833, each filed April 30, 1996. Further, Applicant has added new claims 86-131 and 143 which are relevant to this Request.

IV. THE PROPOSED COUNTS FOR INTERFERENCE

In accordance with 37 CFR §1.607(a)(2), Applicant proposes Counts 1 and 2 set forth below. Count 1 defines a

method of controlling the operation of a vehicle drive, and Count 2 defines a vehicle drive system. The proposed Count 1 corresponds exactly to the Desautels '115 patent claim 8 and to Genise '164 application claim 91. The proposed Count 2 is in the "OR" format and corresponds exactly to Desautels '115 patent claim 18 and to claim 100 of the present application - or to claim 143 of the present application.

COUNT 1

A method of controlling the operation of a vehicle, comprising the steps of:

a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission, and said electronic control unit being operable to calculate the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged;

b) operating a vehicle using the system provided in step a);

c) determining a currently engaged gear by calculating the ratio of the engine and transmission output shaft speeds, and comparing said calculated ratio to expected ratios;

d) determining whether an upshift or a downshift is to be expected as the next shift;

e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and

f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and

g) shifting said multi-speed transmission toward said next expected gear.

COUNT 2

A vehicle drive system comprising:

a) an engine having an output shaft;

b) an electronic control unit for controlling an output speed of said engine;

c) a multi-speed transmission operably connected to be driven by said engine output shaft;

d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and

e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.

OR

A vehicle drive system comprising:

a) an engine having an output shaft;

b) an electronic control unit for controlling an output speed of said engine;

c) a multi-speed transmission operably connected to be driven by said engine output shaft;

d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and

e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit that a particular shift is to be expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and based on receiving said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.

V. DESIGNATION OF CLAIMS CORRESPONDING TO THE COUNTS

1. Identification of Claims In The Desautels et al '115 Patent Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(3), Applicant identifies method claims 1-17 and 26-30 of the Desautels '115 patent as corresponding to proposed Count 1. The proposed Count 1 is claim 8 of the Desautels et al '115 patent. All of the claims 1-17 and 26-30 of the Desautels et al '115 patent are proposed to correspond to Count 1 because they all define the same patentable invention.

Applicant identifies apparatus claims 18-25 as corresponding to proposed Count 2. The proposed Count 2 is claim 18 of the Desautels et al '115 patent (or claim 143 of the present application). All of the claims 18-25 of the Desautels et al '115 patent are proposed to correspond to Count 2 because they all define the same patentable invention.

2. Offer of Claims In This Application Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(4), Applicant submits that method claims 86-99 and 105-108 of the Genise '164 application correspond to proposed Count 1, and that apparatus claims 100-104, 109-131 and 143 of the Genise '164 application correspond to proposed Count 2. The added claims 109-131 correspond to claims 1-7, 12-15, 47-60 of U.S. Appln. No. 08/649,830. The remaining claims 8-11 and 16-46 of Appn. No. 08/649,830 are believed to define a patentably distinct invention from the proposed Counts 1 and 2, and therefore have not been added to this application. Specifically, claims 8-11 and 16-46 of Appln. No. 08/649,830 recite the features of sensing neutral based on input and output shaft speed signals, of splitter shifting, and informing the operator of a target gear ratio, and are believed to be patentably distinct from proposed Counts 1 and 2.

VI. SUPPORT FOR CLAIMS 86-131 and 143 OF THE GENISE '164 APPLICATION

In the Table below Applicant has applied each of the new claims 86-131 to the specification pursuant to 37 CFR §1.607(1)(5)(ii).

Claims 86-131 and 143	**Specification of U.S. Appln. No. 08/666,164**
86. A method of controlling the operation of a vehicle drive comprising the steps of:	Fig. 3 shows the control operation of a vehicle.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine, a multi-speed tra[ns]mission to be driven by said engine output shaft, a manual stick shift for allowing an operator to manually shift said multi-speed transmission between several speed ratios, and a driver intent switch allowing a driver to provide an indication to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit using said driver intent signal to determine what the next speed ratio to be engaged by a manual shift by the operator will be,	Fig. 3 shows an engine 102 having an output shaft, an electronic control unit 148, 112 for controlling the speed of the engine 102 output shaft. Engine 102 output shaft is connected to a multi-speed transmission 10 through clutch 104. Fig. 3 also shows a manual stick shift 57 for allowing an operator to shift ratios of transmission 10. Fig. 3 shows a display 124 displaying the present gear and the next appropriate gear and a driver intent to shift switch 120 which provides an indication to electronic controller 146, 112 of whether an upshift or a downshift is to be expected. In response to receiving the intent to shift signal, the controller 146, 112 determines the next expected ratio to be engaged by a manual shift of lever 57 by an operator (Page 11, line 26 to Page 12, line 24). Further, page 1, line 23 of the '164 appln. incorporates by reference U.S. Patent 4,361,060 which shows (Fig. 1) the up "U" and down "D" positions of shift control 26 and Fig. 4 shows gear counter circuit 113 and the up (MUP) and down (MDN) driver control signals. See also col. 11, lines 37-40 of U.S. Patent 4,361,060. Further, page 1, line 23 incorporates by reference U.S. Patent No. 4,648,290 which discloses (Fig. 3) gear selector 1 which includes up and down shift requests. (Col. 6, lines 25-38 of the '290 patent).

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
said electronic control unit then determining what engine synchronized speed would be necessary to achieve a synchronized shift to said next speed ratio at the present transmission output speed, and said electronic control being operable to change the output speed of said engine output shaft to achieve said synchronized speed;	U.S. Patent 5,053,961 is incorporated by reference on page 1, line 24 and Fig. 2 shows driver control console 105 with up/down buttons 120, 124 (col. 5, line 67 through col. 6, line 16). Display unit 124 will display the next appropriate gear shift and controller 146 determines and causes the engine sync. values for the next gear. Page 11, lines 1-5, page 13, lines 3-26; Fig. 2, Fig. 5.
b) operating a vehicle using the system provided in step a);	Figs. 5A, 5D.
c) determining a currently engaged gear;	Fig. 5D, page 10, lines 27-31.
d) utilizing said driver intent switch to provide a signal of whether an upshift or a downshift will be the next expected shift;	Shift knob 118 includes a driver intent-to-shift button 120. If the display 124 indicates a lever upshift or downshift is appropriate, then operator may select save by using button 12. Page 12, line 13-page 13, line 30.
e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based upon said currently engaged gear and said shift intent signal of step d), identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and	Figs. 5A and 5D, Fig. 4; Based on receiving the intent to shift signal, ES-engine sync speed is determined by multiplying the next gear by the transmission output shaft speed. Page 13, lines 21-30.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
f) beginning to control said output speed of said engine output shaft to approach said synchronization speed, and	Page 13, lines 21-30.
g) manually shifting said multi-speed transmission to said next expected gear.	Shift lever 57 (Fig. 31 and page 13, lines 21-30).
87. A method as recited in claim 86, wherein a signal is provided to said electronic control unit of when said multi-speed transmission has moved to neutral, and said electronic control unit beginning to change said engine speed once it receives said signal.	Page 10, lines 27-31 disclose neutral condition is sensed by comparing input/output shaft rotational speeds to known gear ratios. Page 12, lines 4-12 disclose engine controller 146 issues commands upon confirming neutral condition to change the speed of the engine.
88. A method as recited in claim 87, wherein said electronic control unit determines said currently engaged gear by monitoring the output speed of said engine output shaft and said transmission output shaft, calculating a ratio, comparing said calculated ratio to expected ratios in a look-up table, and identifying said currently engaged gear by matching said calculated ratio to the look-up table ratios.	Page 10, lines 23-31.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
89. A method as recited in claim 88, where said identified currently engaged gear is stored, and is periodically identified during operation of the vehicle, and the stored currently engaged gear is updated when necessary.	Fig. 5A and page 10, lines 20-31.
90. A method as recited in claim 86, wherein a clutch is disposed between said engine output shaft and said transmission.	Fig. 3 shows clutch 104 disposed between engine 102 output shaft and transmission 10.
91. A method of controlling the operation of a vehicle, comprising the steps of:	Fig. 3 and Figs. 5 and 6.
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission, and said electronic control unit being operable to calculate the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged;	Fig. 3 - engine 102, controller 146, 112, Fig. 4, pages 10-13.
b) operating a vehicle using the system provided in step a);	Figs. 3, 5 and 6.
c) determining a currently engaged gear by calculating the ratio of the engine and transmission output shaft speeds, and comparing said calculated ratio to expected ratios;	Fig. 5D, page 10, lines 27-31, and Fig. 4.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
d) determining whether an upshift or a downshift is to be expected as the next shift;	Fig. 4; page 10, line 15-page 13, line 7.
e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and	Figs. 4, 5A, 5D - page 12, line 13 to page 13, line 30.
f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and	Page 13, lines 21-30.
g) shifting said multi-speed transmission toward said next expected gear.	Shift lever 57 (Fig. 3 and page 13, lines 21-30.
92. A method as recited in claim 91, wherein the determination of step d), includes providing an operator shift intention switch, and moving said switch between position indicating an upshift or a downshift as appropriate.	Operator intent to shift button 120 - Fig. 3. The operator may select an upshift or a downshift as appropriate, based on button 120 and the upshift or downshift gear being displayed 124. Page 12, line 13-page 13, line 30.
93. A method as recited in claim 92, wherein step f) does not occur until a signal is received that said transmission has moved into neutral.	Page 12, lines 4-9.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
94. A method as recited in claim 91, wherein said determination of step d) is made by said electronic control unit based upon vehicle operating parameters.	Fig. 4 shows that upshifts or downshifts are determined by operating parameters.
95. A method as recited in claim 94, wherein step f) does not occur until a signal is received that said transmission has moved into neutral.	Page 12, lines 4-9.
96. A method as recited in claim 91, wherein step f) does not occur until a signal is received that said transmission has moved into neutral.	Page 12, lines 4-9.
97. A method as recited in claim 91, where said identified currently engaged gear is stored, and is periodically identified during operation of the vehicle and the stored currently engaged gear is updated when necessary.	The flowchart of Fig. 5(a) shows that the currently engaged gear is displayed and is periodically identified and updated during operation.
98. A method as recited in claim 91, wherein a clutch is disposed between said engine output shaft and said transmission.	Fig. 3 shows clutch 104 between engine 102 output shaft and transmission 12.
99. A method as recited in claim 91, wherein step e) is repeated periodically to consider changes in said transmission output speed.	The flowcharts of Figs. 5A-5D/
100. A vehicle drive system comprising:	Fig. 3 shows a vehicle drive system.
a) an engine having an output shaft;	Engine 102 - Fig. 3.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
b) an electronic control unit for controlling an output speed of said engine;	Engine controller 146, 112 (Fig. 3).
c) a multi-speed transmission operably connected to be driven by said engine output shaft;	Transmission 12 connected to engine 102 output shaft - Fig. 3.
d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and	The stick shift lever 57 (Fig. 3).
e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.	Based on receiving intent-to-shift button 120, controller 146 (Fig. 3) causes the displayed upshift or downshift gear to be selected (page 12, line 13-page 13, line 30). Engine sync. speed is determined and the engine is controlled to move towards the sync. speed (page 13, lines 21-30).
101. A system as recited in claim 100, wherein said electronic control unit calculates and updates said currently engaged gear during operation of said system.	The flowcharts of Figs. 5A-5D.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
102. A system as recited in claim 100, wherein a clutch is disposed between said engine output shaft and said transmission.	Fig. 3 shows clutch 104 between engine 102 output shaft and transmission 12.
103. A vehicle drive system as recited in claim 100, wherein said electronic control unit is provided with a look-table of the speed ratios at the several available gear in said multi-speed transmission.	Page 10, lines 27-31.
104. A system as recited in claim 103, wherein said electronic control unit utilizes said look-up table to determine said currently engaged gear, and also to determine a speed ratio at said next expected gear.	Fig. 4 and Page 11, lines 13-25 and Fig. 2; and page 10, lines 26-31.
105. A method of controlling the operation of a vehicle, comprising the steps of:	Fig. 3 shows the control operation of a vehicle

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear, and the transmission output speed;	Fig. 3 shows an engine 102 having an output shaft, an electronic control unit 148, 112 for controlling the speed of the engine 102 output shaft. Engine 102 output shaft is connected to a multi-speed transmission 10 through clutch 104. The system determines a currently engaged gear by comparing the input shaft/output shaft rotational speeds to known gear ratios (page 12, lns. 5-9). Display unit 124 will display the next appropriate gear shift and controller 146 determines and causes the engine to approach syn. values for the next appropriate gear. (Page 13, lns. 3-26; Fig. 2).
b) operating a vehicle using the system provided in step a);	The vehicle is operated using the above system.
c) periodically determining the currently engaged gear by monitoring system variables;	The engaged conditions of transmission 10 is sensed by comparing the input shaft/output shaft rotational speeds to known gears for a period of time. (Page 10, lines 27-31). Each time the routine shown in Fig. 5A is performed, engine speed, input shaft speed and output shaft speed are compared to determine the currently engaged gear.
d) determining whether an upshift or a downshift is to be expected as the next shift;	Page 11, lines 13-25 describe the operation of determining whether an upshift or a downshift is to be expected as the next shift; Fig. 4.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
e) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;	Controller 146 determines and causes the engine to approach syn. values for the next appropriate gear. (Page 10, lines 4-26; page 11, line 31 through page 12, line 12).
f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and	When beginning to engage a target ratio, engine is controller relative to true sync. speed. (Page 11, lines 1-5; page 12, lines 4-12).
g) manually shifting said multi-speed transmission towards the next expected gear.	Upon confirmation of the sync. condition, the operator manually shifts to the next expected gear. (Page 12, lines 9-12; page 12, line 31 through page 13, line 2).
106. A method of controlling the operation of a vehicle, comprising the steps of:	Figs. 5A-5D show a method of controlling the operation of a vehicle.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear,	Engine 102, controller 146, 112, transmission 12 - Fig. 3. Controller 146 determines and causes the engine to approach sync. values for the next expected speed after the next expected gear is determined. Fig. 4, page 11, line 31 to page 12, line 12.
and the transmission output speed, and providing an operator with a shift intent switch to provide a signal to said electronic control unit of whether an upshift or a downshift is expected as said next expected shift, said electronic control unit being operable to calculate the ratio of the transmission and engine output speeds to determine a currently engaged gear, and determine a next-expected gear based upon said currently engaged gear and said driver shift intent signal;	Fig. 3 - intent-to-shift button 120 in response to depression thereof causes the upshift or downshift being displayed to be selected. Page 13, lines 3-30. Fig. 4 shows the calculation for the next expected gear. The currently engaged gear is selected by comparing input shaft/output shaft speeds to known gears (page 10, lines 27-31).
b) operating a vehicle using the system provided in step a);	Figs. 5A-5D.
c) determining a currently engaged gear;	Page 10, lines 27-31.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
d) determining whether an upshift or a downshift is to be expected as the next shift based upon a signal from said driver shift intent switch;	Page 13, lines 3-30 and Fig. 4.
e) receiving a signal that said transmission has been moved to neutral;	Page 12, lines 13-page 13, line 7.
f) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;	Page 13, lines 21-26.
g) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and	Page 13, lines 21-26.
h) manually shifting said multi-speed transmission towards said next expected gear.	Page 13, lines 21-26 and shift lever 57 (Fig. 3).
107. A method of controlling the operation of a vehicle, comprising the steps of:	Figs. 5A-5D.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being operable to determine a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear, and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear, and the transmission output speed, and providing an operator with a shift intent switch to provide a signal to said electronic control unit of whether an upshift or a downshift is expected as said next expected shift,	Fig. 3 shows an engine 102 having an output shaft, an electronic control unit 148, 112 for controlling the speed of the engine 102 output shaft. Engine 102 output shaft is connected to a multi-speed transmission 10 through clutch 104. The system determines a currently engaged gear by comparing the input shaft/output shaft rotational speeds to known gear ratios (page 12, lns. 5-9). Display unit 124 will display the next appropriate gear shift and controller 146 determines and causes the engine to approach syn. values for the next appropriate gear. (Page 13, lns. 3-26; Fig. 2). Operator intent to shift button 120 provides a signal to controller 146 indicating whether the upshift or downshift being displayed is expected. Page 12, line 12-page 13, line 10.
said electronic control unit being operable to calculate the ratio of the transmission and engine output speeds to determine a currently engaged gear, and determine a next-expected gear based upon said currently engaged gear and said driver shift intent signal;	The input shaft/output shaft rotational speeds are used to determine the currently engaged gear (page 10, lines 27-31). Based on receiving the intent-to-shift signal, the controller 146 determines the next appropriate gear (Fig. 4, page 12, line 12-page 13, line 8; Fig. 4).
b) operating a vehicle using the system provided in step a);	Figs. 5A-5D, Fig. 3.
c) determining a currently engaged gear;	Page 10, lines 27-29.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
d) determining whether an upshift or a downshift is to be expected as the next shift based upon a signal from said driver shift intent switch;	In response to drive button 120, controller determines if an upshift or a downshift is expected. Page 12, line 12-page 13, line 10.
e) receiving a signal that said transmission has been moved to neutral;	Page 12, line 4-page 13, line 7.
f) determining a desired engine synchronization speed at a next-expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed;	Page 13, lines 21-30.
g) beginning to control said output speed of said engine output shaft to approach said synchronization speed, and repeating steps e) and f); and	Page 13, lines 21-30.
h) manually shifting said multi-speed transmission towards said next expected gear.	Fig. 3 - manual shift lever 57, page 13, lines 21-30.
108. A method as recited in claim 107, wherein a manual stick shift is used to change the transmission speed ratios.	Shift lever 57 - Fig. 3.
109. A manually shifted vehicular transmission system comprising:	Fig. 3 shows a manually shift transmission system.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
a transmission section having an input shaft driven by a fuel-controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions;	Fig. 3 shows a transmissio section 12 having an input shaft driven by an engine 102, and output shaft and a plurality of selectable drive ratios and neutral. Fig. 3 shows a manual stick shift 57 for shifting between a plurality of different shift positions 126, 128, 130, 132, 134 and 136 for selectively engaging and disengaging jaw clutches.
means to sense a transmission section neutral condition;	Page 10, lines 27-31.
means to determine a forward target gear ratio; and	Page 10, lines 27-31.
means to automatically control fueling of the engine, said means effective, upon sensing transmission section neutral, to cause the engine to achieve a synchronous speed for engaging said target gear ratio.	Engine controller 146, 112 automatically controls engine fueling. Page 13, lines 21-30 describes achieving synchronous speed for engaging the target gear.
110. The system of claim 109 wherein said transmission section comprises a main transmission section (12) of a compound transmission.	Transmission 12 is a compound transmission including aux. transmission 14 - Fig. 3.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
111. The system of claim 109 further comprising means to sense engagement of said target gear ratio, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed engagement of said target ratio.	Page 13, lines 21-30.
112. The system of claim 109 wherein said jaw clutches are non-synchronized jaw clutches.	Page 5, lines 26-28.
113. The system of claim 109 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.	Master friction clutch 104 - Fig. 3; signal CL indicates clutch engaged or disengaged condition, page 9, lines 18-21. Page 13, lines 8-12 describe returning control to the operator when non-engagement of the friction clutch 104 is sensed.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
114. The system of claim 111 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.	Master friction clutch 104 - Fig. 3; signal CL indicates clutch engaged or disengaged condition, page 9, lines 18-21. Page 13, lines 8-12 describe returning control to the operator when non-engagement of the friction clutch 104 is sensed.
115. The system of claim 112 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch and further comprising means for sensing a non-engaged condition of said friction clutch, said means to automatically control fueling effective to cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.	Master friction clutch 104 - Fig. 3; signal CL indicates clutch engaged or disengaged condition, page 9, lines 18-21. Page 13, lines 8-12 describe returning control to the operator when non-engagement of the friction clutch 104 is sensed.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
116. The system of claim 109 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.	Page 12, lines 13-24.
117. The system of claim 111 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.	Page 12, lines 13-24.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
118. The system of claim 112 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.	Page 12, lines 13-24.
119. The system of claim 113 further comprising means to sense conditions indicative of an operator intent to shift into transmission section neutral from a currently engaged ratio, said means to automatically control fueling effective to cause the engine to be fueled to minimize torque at currently engaged jaw clutches in response to sensing said conditions indicative of an operator intent to shift into transmission section neutral.	Page 12, lines 13-24.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
120. The system of claim 111 further comprising sensors for providing input signals indicative of input shaft and output shaft speeds, said means to sense engagement of said target gear ratio making such determination as a function of said speed signals.	Page 10, lines 27-31.
121. The system of claim 109 further comprising sensors for providing input signals indicative of input shaft and output shaft speeds, and means for sensing engagement of said drive ratios as a function of said speed signals.	Page 10, lines 27-31.
122. The control system of claim 109 wherein said engine includes a microprocessor-based engine controller mounted to said engine and having a memory, said means to sense transmission neutral, determine a target gear ratio and automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.
123. The control system of claim 109 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 nd 27-31.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
124. The control system of claim 113 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.
125. The control system of claim 114 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.
126. The control system of claim 116 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.
127. The control system of claim 117 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
128. The control system of claim 119 wherein said engine includes a microprocessor-based engine controller having a memory, said means to determine a target gear ratio and to automatically control fueling comprising logic rules stored in said memory.	Page 10, lines 4-11 and 27-31.
129. A microprocessor-based system controller for controlling a manually shifted vehicular transmission system comprising a transmission section having an input shaft driven by a fuel-controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions, said system controller having a memory storing logic rules effective:	Page 10, lines 4-11 describe a microprocessor type control unit. Transmission 12 is a manual transmission (shift lever 57) which has an input shaft driven by fuel-controlled engine 102, an output shaft, several selectable drive ratios and neutral by engaging/disengaging jaw clutches. Page 10, lines 4-11 describe a memory for storing logic rules.
to sense a transmission section neutral condition;	Page 10, lines 27-31.
to determine a forward target gear ratio;	Page 10, lines 27-31.

Claims 86-131 and 143	**Specification of U.S. Appln. No. 08/666,164**
to automatically control fueling of the engine, including, upon sensing transmission section neutral, causing the engine to achieve a synchronous speed for engaging said target gear ratio; and	Page 12, line 13 through page 13, line 7.
to sense engagement of said target gear ratio and to automatically cause engine fueling to be in accordance with operator demand upon sensed engagement of said target gear ratio.	Page 13, lines 8-12.
130. The system controller of claim 123 wherein said engine is drivingly connected to said input shaft by a manually controllable friction clutch, said logic rules further comprising logic rules for sensing a non-engaged condition of said friction clutch, and to automatically cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.	Fig. 3 shows master clutch 104 drivingly connected to engine 102. Page 13, lines 10-12 describe immediately returning operation to the operator upon sensing non-engagement of the friction clutch 104. Figs. 5A-5D show logic rules for sensing a non-engagement condition of the friction clutch.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
131. A microprocessor-based system controller for controlling a manually shifted vehicular transmission system comprising a transmission section having an input shaft driven through a manually controllable friction clutch by a fuel-controlled engine, an output shaft, a plurality of selectably engageable and disengageable drive ratios, and a selectable neutral, all of said drive ratios and neutral selected by means of selectively engaged and disengaged jaw clutches operatively positioned by a manually operated shift lever having a plurality of shift lever positions, said system controller having a memory storing logic rules effective:	Page 10, lines 4-11 describe a microprocessor type control unit. Transmission 12 is a manual transmission (shift lever 57) which has an input shaft driven by fuel-controlled engine 102, an output shaft, several selectable drive ratios and neutral by engaging/disengaging jaw clutches. Page 10, lines 4-11 describe a memory for storing logic rules.
to sense a transmission section neutral condition;	Figs. 5A-5D and page 10, lines 27-31.
to determine a forward target gear ratio;	Figs. 5A-5D and page 10, lines 27-31.
to automatically control fueling of the engine, and effective, upon sensing transmission section neutral, to cause the engine to achieve a synchronous speed for engaging said target gear ratio; and	Page 12, line 13 through page 13, line 7.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
for sensing a non-engaged condition of said friction clutch and to automatically cause engine fueling to be in accordance with operator demand upon sensed non-engagement of said friction clutch.	Page 13, lines 8-12.
143. A vehicle drive system comprising:	Fig. 3 shows a vehicle drive.
a) an engine having an output shaft;	Fig. 3 - engine 102.
b) an electronic control unit for controlling an output speed of said engine;	Fig. 3 - Electronic controller 146, 112 for controlling the output speed of the engine 102.
c) a multi-speed transmission operably connected to be driven by said engine output shaft;	Fig. 3 - Transmission 12 is connected to engine 102 output shaft.
d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and	Manual Stick shift lever 57 allows the operator to change speed ratios of transmission 12 - Fig. 3.

Claims 86-131 and 143	Specification of U.S. Appln. No. 08/666,164
e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit that a particular shift is to be expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and based on receiving said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.	Upon depressing intent to shift button 120, electronic controller 145, 112 initiates a particular shift. Fig. 4 shows the operation of determining the present gear and the next expected gear which are displayed on display 124 - Page 11, lines 26-30. Based on receiving the intent to shift signal, controller determines a sync speed for shifting into the next expected gear, and moves the engine speed to the sync speed when a shift is being made. Page 12, line 13 through paage 13, line 7.

VII. THE BURDEN OF PROOF

Since the application for the Desautels et al '115 patent was co-pending with the Genise '164 application, Genise's burden is to establish prima facie entitlement to priority relative to the Desautels et al '115 patent's filing date of July 27, 1995. 37 CFR §1.608(b).

VIII. SUMMARY OF APPLICANT'S POSITION

In support of his showing of priority, submitted herewith are the Affidavits of Thomas A. Genise, Ronald K. Markyvech, Warren R. Dedow, John Dresden III, Jon Steeby, and Steve Edelen together with contemporaneous documentary exhibits. This evidence will show the following:

1. Thomas Genise is an engineer at Eaton Corporation's Corporate Research & Development Center in Detroit, Michigan (CORD-DC) in the automated transmission development program for heavy duty vehicles. Since July of 1996, Ron Markyvech has worked at CORD-DC. Since 1996, Ron Markyvech has worked as a senior product engineer. Since 1990 James McReynolds has worked for Eaton Corp. as head of Product Planning and Strategic Planning for North America.

2. The automated transmission development program of Eaton Corporation included related automated transmission projects under the names "AutoShift", "AutoSplit" and "Top Two". These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral, and to thereafter control engine fueling to achieve a synchronization speed for shifting into the next gear.

3. Ronald Markyvech and Thomas Genise with the assistance of John Dresden III designed, developed, built and tested the AutoSplit multi-speed transmission system.

4. The AutoSplit transmission was implemented in a Freightliner truck having a ten speed transmission.

5. The Freightliner truck having the ten speed AutoSplit transmission included the subject matter defined in Counts 1 and 2, and successfully completed a three day road test between August 29-31, 1994. Thomas Genise, Ronald Markyvech and John Dresden all participated in the August 29-31, 1994 road trip.

6. The Freightliner truck having the ten speed AutoSplit transmission was successfully demonstrated at Eaton Corporation's proving grounds in Marshall, Michigan, on January 11, 1995. Eaton engineers John Steeby and Warren Dedow who were familiar with the AutoSplit transmission including its software code structure, attended the demonstration and actually drove the Freightliner truck.

7. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Truck Transmission Concept Prototype. This Technical Report described the invention defined in Counts 1 and 2, and was widely distributed to Eaton engineers and members of Eaton's upper management.

8. On July 14, 1995, Eaton Corporation held an "Automation Strategic Planning Meeting" at Eaton's Proving Grounds in Marshall, Michigan. At this meeting trucks with automated transmissions including the AutoSplit, AutoShift and Top Two transmissions were demonstrated to several Eaton engineers and members of upper management. Thomas Genise successfully demonstrated the Freightliner truck having the ten speed

AutoSplit transmission at the July 14, 1995 Meeting. As part of these demonstrations, the attenders were given rides on the Freightliner truck and also were able to actually drive the truck.

9. From prior to July 27, 1995 to the filing date of the Genise '164 application on June 19, 1996, Thomas Genise and Ron Markyvech continuously worked on Eaton's AutoSplit/AutoShift/Top Two automated transmission systems for commercial application. This work included supervising mechanical technician John Dresden III.

10. The '164 patent application was filed on June 19, 1996.

As discussed below, the Genise proofs demonstrate that Genise is <u>prima facie</u> entitled to priority relative to the Desautels et al '115 patent filing date of July 27, 1995 based on:

1. Actual reduction to practice in August 1994, January 1995 and July 1995; and
2. Conception plus diligence from prior to July 27, 1995 to a constructive reduction to practice on June 19, 1996.

IX. STATEMENT OF FACTS

1. Since January of 1982, Thomas Genise has worked as an engineer for Eaton Corporation in the Corporate Research and Development - Detroit Center (CORD-DC) in the automated

transmission development program for heavy duty vehicles. (Genise Affd. ¶3).

Since July 1976, Ron Markyvech has worked as an engineer for Eaton Corp. at CORD-DC in the automated transmission development program for heavy duty vehicles. (Markyvech Affd. ¶3).

Since 1990 James McReynolds has worked for Eaton Corporation at TACONA as the head of Product Planning and Strategic Planning for North America. (McReynolds Affd. ¶3).

2. In early 1993, McReynolds conceived of a partially-automated transmission system which would be easier to drive than a manual transmission system, but which would be considerably less expensive than a fully automatic transmission system which does not contain a shift lever. (McReynolds Affd. ¶4). In conceiving the transmission system McReynolds realized that considerable expense is associated with eliminating the shift lever of a transmission system. McReynolds conceived of a partially automated transmission system which maintains the shift lever - thereby reducing the cost of the system - but which allows the driver to shift gears without disengaging the master clutch and without manipulating the throttle pedal. (McReynolds Affd. ¶4-5). On August 11, 1993, McReynolds faxed a specification-type document (Exhibit A) to Eaton's patent counsel, Howard D. Gordon. Exhibit A describes a partially automated transmission system which provides clutchless and throttleless shifting with a shift lever. The shift lever includes a switch at the top of the knob which when depressed

causes the engine fueling to be controlled so as to minimize torque between the engine and the transmission thereby allowing the operator to shift into neutral. Thereafter, the system controlled the engine to achieve the synchronization speed of the next gear, allowing the operator to easily shift into the next gear.

3. Sometime in August 1993, McReynolds called Tom Genise to discuss the possibility of Genise developing the partially automated transmission system which McReynolds named "AutoStick". (McReynolds Affd. ¶7). Specifically, McReynolds explained to Genise that the "AutoStick" transmission would include a shift lever, a shift button which the driver would depress in order to upshift or downshift. In response to depressing the button, the system would automatically control engine fueling to minimize torque, thereby allowing the driver to move the shift lever to neutral without using the clutch pedal, and after sensing neutral, the system would automatically control engine fueling to approach the synchronization speed for the next gear, thereby allowing the driver to move the shift lever to the next gear without manipulating the throttle. (McReynolds Affd. ¶8-9). On September 7, 1993, McReynolds faxed the specification-type document (Exhibit B) to Genise. (Genise Affd. ¶8).

4. Genise renamed AutoStick as "AutoSplit", and on November 15, 1993, Genise sketched on an electronic white board three options of how AutoSplit could be implemented during a meeting at CORD-DC (Genise Affd. ¶9). Exhibit C is a copy of

those three sketches. Options 1, 2 and 3 show a manual transmission, a display unit for displaying the different gear ratios, an engine control unit for controlling the engine and a stick shift having a switch pad (options 1 and 3) or up/down buttons (options 2) for initiating the shift. Genise explained that in response to the driver depressing the switch pad or up/down buttons, the engine control unit controls engine fueling so as to reach a zero torque level, thereby allowing the driver to move the shift lever to the neutral position. Genise further explained that after neutral was sensed, the engine control would control engine fueling to approach the synchronization speed for the next gear (Genise Affd. ¶9).

5. On December 9, 1993, Genise prepared a project proposal for a concept AutoSplit, called "Electronically Enhanced Super 10". Exhibit D is a copy of the December 9, 1993 proposal. Exhibit D includes several options for implementing AutoSplit including different versions of the intent-to-shift switch.

6. On May 13, 1994, Genise prepared with the assistance of W. M. Mack an "AutoSplit Specification for the Concept Prototype". Exhibit E is a copy of the specification which includes a description of the different engine control routines for the system. Specifically, section 5.5.4 of Exhibit E describes the "predip" mode during which the AutoSplit algorithm fuels the engine to provide zero driveline torque, and a "sync" mode which occurs when neutral is sensed and which commands the

engine to approach the synchronization speed for the newly selected gear.

7. Between May 1994 and July 1995 Eaton's automated transmission program included, besides AutoSplit, related automated transmission projects under the names "AutoShift" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All three of these projects were transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All of these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). Specifically, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

8. In May 1994, construction of a AutoSplit automated transmission prototype began. (Genise Affd. ¶11, Markyvech Affd. ¶6). Thomas Genise, Ron Markyvech and John Dresden III were the personnel at CORD-DC working on the AutoSplit project at this time (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Tom Genise was the system engineer for the AutoSplit project, Ron Markyvech was the software engineer for the project, and John Dresden III was the driver/mechanic for the project (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5).

Exhibit 1 is a copy of a May 1994 project report prepared by Ron Markyvech and entitled "AUTOSPLIT CONCEPT PROTOTYPE" which included a general description of the AutoSplit transmission, and the work that was planned for the project. The project report shows that the object of the project was to design and build a concept prototype transmission to demonstrate the AutoSplit concept.

9. In August of 1994, a prototype of the AutoSplit transmission system was completed and implemented in a ten speed Freightliner truck. (Genise Affd. ¶11, Markyvech Affd. ¶8, Dresden Affd. ¶6). This AutoSplit prototype was successfully tested during a three day extensive road trip between August 29-31, 1994. (Genise Affd. ¶11 and 13, Markyvech Affd. ¶8, Dresden Affd. ¶6). The three day trip originated from Southfield, Michigan and included stops at Marshall, Michigan and Traverse, Michigan. The test driving team included Tom Genise, Ron Markyvech and John Dresden III. (Genise Affd. ¶12, Markyvech Affd. ¶8, Dresden Affd. ¶6). Exhibit 2 is a copy of a August 1994 Project Report for the AutoSplit project which mentions the August 29-31, 1994 AutoSplit road trip. Exhibit 3 is a copy of Ron Markyvech's Travel and Business Expense Report for the August 29-31, 1994 road trip. At the top right hand corner of the Expense Report, there is an indication that the expenses occurred from August 29 to August 31, 1994. Towards the bottom half portion of the Expense Report next to the heading "Purpose of Trip:", there is the notation "Project #5956-01 AutoSplit Concept

Transmission Development Road Trip". Project #5956-01 was the project number for the AutoSplit project. (Markyvech Affd. ¶9). In the section explaining the day by day expenditures, there is an indication that Ron Markyvech paid for the meals of Tom Genise and John Dresden III.

10. The AutoSplit transmission system prototype that was successfully tested between August 29-31, 1994 was implemented in a Freightliner truck. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The Freightliner truck included an engine, an engine output shaft, an engine Electronic Control Unit (ECU) for controlling the engine speed and other engine parameters, a transmission ECU for controlling the engine ECU through a SAE J-1939 communication data link, a ten-speed transmission, a master clutch connected between the engine and the transmission, and a clutch pedal for controlling the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Exhibit 4 is a block diagram of the AutoSplit transmission system which was prepared by Ron Markyvech prior to January 1995, and is an accurate representation of the prototype tested between August 29-31, 1994. (Markyvech Affd. ¶10). Exhibit 4 shows a manual ten speed transmission, an engine control unit ECU2 connected to the engine via a J1939 data communication link input and output shaft sensors, a display unit for displaying the ten different gear ratios, and an intent-to-shift switch mounted on the shift lever and connected to the engine control unit.

11. The Freightliner truck also included transmission input and output shaft speed sensors, a manual stick shift for allowing the driver to manually shift the transmission between the ten different speed ratios, a display panel mounted on the shift lever for displaying the presently engaged gear and the appropriate next gear, and a laptop computer which acted as an operator intent-to-shift control switch or button for sending a signal to the transmission ECU indicating whether an upshift or a downshift is to be initiated as the next gear shift, and for requesting that the engine be fueled to minimize driveline torque thereby allowing easy disengagement of an engaged ratio without requiring disengagement of the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

12. An upshift was initiated when the operator depressed keys of the keyboard of the laptop computer while an upshift was being displayed on the display, and a downshift was initiated when the operator depressed keys while a downshift was being displayed. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The operator intent to shift signal from the depressed keys of the keyboard initiated the upshift or the downshift by first signalling to the transmission ECU a desire to eliminate or minimize torque between the engine output shaft and the transmission output shaft. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Based upon receiving the operator intent to shift signal, the transmission ECU modified the engine fueling to reduce torque to the transmission without disengaging the

master clutch. The operator could then easily shift the transmission to neutral. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

13. Based upon receiving the intent to shift signal, and after sensing that the transmission was shifted to neutral, the transmission ECU then controlled the engine to achieve a determined engine speed necessary for the next gear ratio. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

14. Exhibits 5-11 are photocopies of photographs of the actual hardware elements used during the August 29-31, 1994 trip. Specifically, Exhibit 5 is a photograph of the actual ten-speed transmission used in the test. Exhibit 6 is a photograph of the actual transmission ECU, Exhibit 7 is a photograph of the actual engine and engine ECU, Exhibit 8 is a photograph of the actual electrical wiring harness, Exhibit 9 is a photograph of the actual display panel which was mounted on the shift lever, Exhibit 10 is a photograph of the actual master clutch foot pedal, and Exhibit 11 is a photograph of the actual truck used during the August 29-31, 1994 trip. (Genise Affd. ¶14, Markyvech Affd. ¶11, Dresden Affd. ¶8).

15. The AutoSplit transmission system tested during the August 29-31, 1994 trip included several software engine control routines. These software routines were implemented in the transmission ECU. (Genise Affd. ¶15, Markyvech Affd. ¶12). Exhibit 12 is a printout of the actual software code contained in the transmission ECU during the August 29-31, 1994 test trip.

The front page of Exhibit 12 identifies the dates of the various files contained in the software program, with the latest date being August 29, 1994. With the assistance of Tom Genise, Ron Markyvech wrote the software program of Exhibit 12 which is written in "C" computer language. (Genise Affd. ¶15, Markyvech Affd. ¶12).

16. One of the several software engine control routines of Exhibit 12 is able to predict or determine zero flywheel torque based on system variables, and then modify engine speed to achieve the zero torque condition. (Genise Affd. ¶16, Markyvech Affd. ¶13). The zero torque condition enables the driver to easily move the transmission out of gear engagement and into the neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶16, Markyvech Affd. ¶13). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶15, Markyvech Affd. ¶13). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine fueling such that a zero torque condition exists. (Genise Affd. ¶16, Markyvech Affd. ¶13). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶16, Markyvech Affd. ¶13). During the test road trip of August 29-31, 1994, the laptop Personal

Computer (PC) was connected to the communication data link of the AutoSplit system. (Genise Affd. ¶16, Markyvech Affd. ¶13). This allowed the PC to display the predicted torque percentage for achieving zero flywheel torque. (Genise Affd. ¶16, Markyvech Affd. ¶13). During testing on the road trip, function intent_final_pct_trq was commanded to equal the predicted torque percentage as well as other torque percentages. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the zero torque condition existed, the transmission was manually moved out of gear engagement and into a neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function determine_gear from module trns_act.c96 determined when the transmission moved to the neutral. (Genise Affd. ¶16, Markyvech Affd. ¶13).

17. The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft

speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

18. The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

19. During the August 29-31, 1994 road trip, the AutoSplit transmission system was extensively tested by

monitoring data on the PC. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). In particular, the testing included monitoring the torque values after the intent-to-shift switch was recognized by the transmission ECU; monitoring when the transmission was shifted into neutral; monitoring and evaluating the various engine control parameters in different modes of operation (including the torque control mode and speed control mode); and monitoring the transmission input shaft speed. The testing also included evaluating data at the time the transmission shifted into gear and considering the "feel" of the shift for purposes of determining shift quality. (Genise Affd. ¶17 , Markyvech Affd. ¶14, Dresden Affd. ¶10).

20. The road trip of August 29-31, 1994 was considered successful by Genise, Dresden and Markyvech as the AutoSplit transmission system performed well throughout the testing, including successfully operating in the torque control mode and in the speed control mode, during various shift sequences. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). The results were reported in a Technical Report on February 21, 1995 which is discussed in connection with Exhibit 21.

21. During the development of the AutoSplit transmission system, Thomas Genise and Ron Markyvech periodically gave technical presentations to engineers at the Transmission Division of Eaton's Truck Components Operations North America (TCONA) regarding the development and operation of the AutoSplit transmission system. (Genise Affd. ¶18, Markyvech Affd. ¶15).

These presentations often included a detailed discussion of the software code. (Genise Affd. ¶18, Markyvech Affd. ¶15). On September 29, 1994, Ron Markyvech went to TCONA in Galesburg, Michigan to give such a presentation. Exhibit 13 is a copy of an Expense Report dated September 30, 1994, that Ron Markyvech submitted in connection with the September 29, 1994 trip and presentation. The "Purpose of Trip" section of this Expense Report includes the statement: "Project #5956-01 went TCONA for software code walk through and technical presentation on the AutoSplit concept." (Markyvech Affd. ¶15).

22. The AutoSplit transmission prototype was subsequently demonstrated to engineers of Eaton's TCONA on January 11, 1995. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). Tom Genise and Ron Markyvech performed the demonstration. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The Eaton TCONA engineers that attended the demonstration included John Steeby and Warren Dedow, and the structure and operation of AutoSplit were understood by Steeby and Dedow. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶6, Steeby Affd. ¶6). Exhibit 14 is a partial printout of Ron Markyvech's 1995 Personal log. The entry for January 11, 1995, indicates that Markyvech went to Marshall, Michigan and demonstrated the AutoSplit transmission system implemented in the Freightliner truck. During the

September 12, 1994 and the January 11, 1995 demonstrations, John Steeby and Warren Dedow each drove the truck. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7, Steeby Affd. ¶7). The AutoSplit transmission prototype performed well during these demonstrations, operating in the torque control mode and in the speed control mode during various shift sequences providing clutchless and throttleless shifting for the multi-speed transmission. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7-9, Steeby Affd. ¶7-9).

23. The AutoSplit transmission system demonstrated on January 11, 1995 was basically the same system previously demonstrated on September 12, 1994 and tested during the road trip of August 29-31, 1994. (Genise Affd. ¶20, Markyvech Affd. ¶17). One difference between the systems concerned the shift display. In the system demonstrated on September 12, 1994 and tested between August 29-31, 1994, the top portion of the shift lever contained a display for displaying the currently engaged gear and the next gear (Genise Affd. ¶20, Markyvech Affd. ¶17; Exhibit 9). In the system demonstrated on January 11, 1995, the display was re-configured as a separate device mounted on the truck's console. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 15 is a photocopy of the actual display used at the January 11, 1995 demonstration.

24. Another difference between the two systems concerned the shift lever. In the system demonstrated on September 12, 1994 and tested during August 29-31, 1994 trip, the driver

intent-to-shift switch was not placed on the shift lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). During the August 29-31, 1994 trip, the intent-to-shift switch was the PC. The PC was connected to the system's communication data link and the intent-to-shift command was inputted by depressing keys on the keyboard of the PC. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). In the AutoSplit system demonstrated on January 11, 1995, a new shift lever was implemented which included an intent-to-shift switch or button on the lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 16 is a photocopy of the actual shift lever with the intent-to-shift button used during the January 11, 1995 demonstration. The intent to shift button was added to the shift lever on November 10, 1994 as indicated by the entry for this date in Ron Markyvech's log (Exhibit 17) .

25. There was also a modification to the software that was demonstrated on January 11, 1995. Exhibit 18 is a copy of the software code implemented in the transmission ECU demonstrated on January 11, 1995. According to this code, function sequence_shift will call function shift_initiate which will set engine_commands to ENGINE_PREDIP which then calls function control_engine_predip to control automatically the engine torque parameter to zero as a function of predicted zero torque. (Genise Affd. ¶21, Markyvech Affd. ¶18).

26. A further demonstration of the Freightliner truck including the AutoShift system occurred on July 14, 1996 at

Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Thomas Genise described and demonstrated the AutoSplit transmission system on July 14, 1995 to engineers and upper management of Eaton Corporation. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Exhibit 19 is a Travel Expense Report that Genise submitted on July 17, 1995 for the travel he conducted the week of July 10, 1995. This travel included the July 14, 1995 demonstration trip. The "Purpose of Trip" section of the Report indicates that on July 14, 1995, Genise demonstrated the AutoSplit to TCONA management. Exhibit 19 also includes the Travel Expense Report of Ron Markyvech which indicates that he took the AutoSplit Concept Truck for the Automation Planning Meeting.

27. The AutoSplit transmission system demonstrated on July 14, 1995, included the same hardware components and operated according to the same software structure described above in connection with the AutoSplit transmission system demonstrated on January 11, 1995. (Genise Affd. ¶23). The AutoSplit transmission system worked well during the demonstration performing clutchless and throttleless shifts and operating in the torque control mode and speed control mode during various shift sequences. Exhibit 20 is a memo from William A. Baken dated July 17, 1995 setting forth the "Automation Strategic Planning Meeting Minutes" for the July 14, 1995 meeting/demonstration. The third page of the memo indicates that Thomas Genise demonstrated the AutoSplit Concept Truck. Attached to the memo there is a copy of the Agenda for

the July 14, 1995 meeting/demonstration. The Agenda indicates that ride and drive demonstrations were available at 7:00 am and 1:00 pm on July 14, 1995.

28. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Transmission prototype. (Genise Affd. ¶22). Exhibit 21 is a copy of the February 21, 1995 Technical Report which includes descriptions of the various control algorithms, and also provides plotted data of system parameters taken during actual vehicle shift testing.

29. Fig. 1 on page 5 of Exhibit 21 shows a block diagram of the AutoSplit system which includes a multi-speed transmission, an engine, an engine controller ECU2 connected to the engine via a J1939 communication data link, and a driver display for displaying the presently engaged gear, and a possible or desirable upshifted/downshifted gear.

30. The "intent-to-shift" button - described on page 2 of Exhibit 21 - is located on the side of the shift lever and is operated by the driver's thumb. Exhibit 21 describes the software variable for zero driveline torque: needed_percent_for_zero_flywheel_trq. (Exhibit 21, ps. 13-14). This variable is requested via the engine communication data link J1939 by the engine controller (Exhibit 21, p. 12).

31. The AutoSplit Technical Report was signed and approved by Eugene Braun, and was widely distributed throughout Eaton Corporation. The individuals receiving the AutoSplit Technical

Report included Ron Markyvech, Jon Steeby, Warren Dedow, Steve Edelen and Marcel Amsallen (Exhibit 21, cover page).

32. As indicated, during the period of time from the beginning of July 1995 through the end of June 1996, the automated transmission program of Eaton Corporation included related projects under the names "AutoShift", "AutoSplit" and "Top Two". During this time period, continuous efforts were made to develop these related projects so as to provide commercially viable transmission systems. (Genise Affd. ¶24 , Markyvech Affd. ¶19).

33. These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal, thereby assisting the driver with the shift sequence. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral from a gear to be disengaged, and to achieve engine synchronization speed for clutchless engaging a target gear ratio. (Genise Affd. ¶24, Markyvech Affd. ¶19).

34. During the period of time from the beginning of July 1995 through the end of June 1996, Thomas Genise, along with Ron Markyvech under Genise's supervision continuously worked on

developing products for heavy duty trucks in Eaton's automated transmission program. (Genise Affd. ¶24-30, Markyvech Affd. ¶19).

35. Exhibit 22 includes the time sheets for Ron Markyvech, Tom Genise and John Dresden III between July 1995 and June 1996. As indicated in the table below, the majority of Genise's and Markyvech's time, for each month between July 1995 and June 1996, was spent on developing products for the AutoShift/AutoSplit/Top-Two automated transmission projects.

Ron Markyvech	
July '95	83.5 hours
August '95	109.5 hours
Sept. '95	133.0 hours
Oct. '95	169.0 hours
Nov. '95	137.0 hours
Dec. '95	83.5 hours
Jan. '96	101.5 hours
Feb. '96	90.0 hours
Mar. '96	121.0 hours
Apr. '96	121.0 hours
May '96	131.5 hours
June '96	81.0 hours
Total	1,361.5 hours

Tom Genise	
July '95	111.0 hours
Aug. '95	108.5 hours
Sept. '95	111.0 hours
Oct. '95	159.5 hours
Nov. '95	162.5 hours
Dec. '95	121.0 hours
Jan. '96	172.5 hours
Feb. '96	135.5 hours
Mar. '96	119.0 hours
Apr. '96	95.5 hours
May '96	80.5 hours
June '96	110.5 hours
Total	1,487 hours

36. Exhibit 23 includes Markyvech's personal logs for 1995 and 1996. These logs detail his work activity on a daily basis for 1995 and 1996. Exhibit 24 is a collection of Genise's monthly reports for the period between July 1995 and June 1996 as well as the Genise's Travel Expense Reports during this period. Below is a summary of Genise's and Markyvech's product development activities between July 1995 and June 1996 relating to Eaton's AutoSplit/AutoShift/Top Two automated transmission projects.

37. In July 1995, Tom Genise and Ron Markyvech worked on the AutoShift and AutoSplit automated transmission projects. On July 12, 1995, Tom Genise travelled to Galesburg, Michigan to attend a J1939 data communication link meeting. Markyvech's personal log (Exhibit 23) and July 1995 Monthly Report indicate that towards the end of July, Markyvech worked on the transmission manager code for the AutoShift 7-speed transmission project.

38. Throughout August 1995, Markyvech worked on development of the 7 speed AutoShift project. This work included identifying a problem with the reverse gear switch. Specifically, on August 28, 1995, Markyvech uncovered that the reverse gear switch would give a mismatch when trying to engage low gear. This mismatch problem was caused because software function "x_outside_offset" was too small. On August 22, 1995, Genise prepared a Functional Performance Specification for the AutoSplit project (Exhibit 25). On August 30, 1995, Genise distributed an AutoSplit Design Specification sheet (Exhibit 26). Exhibit states that "TACONA has identified the AutoSplit transmission concept as an integral part of their automatic product strategy".

39. On September 29, 1995, Genise travelled to Galesburg, Michigan to attend an automation team meeting. On September 30, 1995, Genise prepared Revision 1.0 of the AutoSplit Product Design Specification (Exhibit 27). In September 1995, Markyvech worked on the AutoSplit and AutoShift transmission projects. On September 11, 1995, Markyvech stripped the AutoSplit wire harness

out of a test vehicle for use in the 7 speed AutoShift test vehicle. Much of the remainder of the month was spent installing and testing the vehicle interface wiring. Markyvech's September 1995 Report for the 7 speed AutoShift details the accomplishments for the month including modification of the base AutoShift software, testing the Freightliner vehicle wire harness, modifying the four rail shift bar housing, installing the transmission in a truck, and starting initial system debugging.

40. In October 1995, Markyvech spent most of his time working on the 7 speed AutoShift vehicle software. Markyvech's October 1995 Report for the 7 Speed Autoshift details the accomplishments for the month which includes modifying the software to account for the varying step sizes of the seven speed transmission, and modifying the software to include the capability of adjusting the upshift point based on the target gear. On October 12, 1995, Genise travelled to Milford, Michigan to grade test the AutoShift transmission system. On October 30, 1995, Genise prepared a Design Specification (Exhibit 28) which indicates that revisions to the AutoSplit development will be continued under another project. Genise also prepared on October 30, 1995, a revised AutoSplit Design Specification (Genise Affd. ¶24; Exhibit 29).

41. Between November 1-3, 1995, Genise travelled through northern Michigan test driving the AutoShift transmission system. On November 17, 1995, Genise prepared a revised Functional Performance Specification for the AutoSplit project (Exhibit 30).

On November 13 and 28, 1995, Genise travelled to Galesburg and Southfield, respectively, test driving the AutoShift transmission. On November 22, 1995, Genise traveled to Traverse City, Michigan, test driving the 7 speed AutoShift system. In November 1995, Markyvech continued work on the 7 speed Autoshift project. On November 21, 1995, Markyvech wrote a miles/hour - function MI_PER_HOUR - reading software routine for the AutoShift, and bench tested the routine. On November 28, 1995, Markyvech tested the AutoShift truck to obtain acceleration data. Markyvech's November 1995 Report for the Autoshift 7-Speed Prototype indicates the accomplishments for the month as including testing the vehicle, and demonstrating the vehicle on November 11, 1995. In November Markyvech also started work on the Top Two project. On November 13, 1995, Markyvech went to Galesburg, Michigan to pick up the Top Two truck that was to be used for evaluation purposes.

42. On December 5, 1995, Genise travelled to Marshall, Michigan test driving the Top 2 truck. On December 20, 1995, Genise travelled to Galesburg, Michigan, for a demonstration of the AutoShift transmission system. In December 1995, Markyvech started working on the performance code for the 10 speed AutoShift. On December 11, 1995, Markyvech tested the performance code for the 10 speed AutoShift. On December 21, 1995, Markyvech tested the 10 speed Autoshift in different performance modes of operation. Markyvech's December 1995 Report indicates that the accomplishments for the month included installing and testing

various software code for allowing the engine to upshift at higher engine RPMs, for adding an additional 400 RPMs to the deceleration rate of the engine during upshifts, for allowing double upshifts, and for using the engine compressing brake when doing skip shifting.

43. Genise and Markyvech spent much of January 1996 developing a skip shiftability function for the AutoShift transmission system. On January 31, 1996, the skip shiftability feature was demonstrated to Marcel Amsallen of Eaton Corporations' Truck Component Operation North Americas (TCONA) in Galesburg, Michigan. On January 16, 1996, Genise travelled to Milford, Michigan, test driving the AutoShift. On January 31, 1996, Genise travelled to Galesburg, Michigan to demonstrate the AutoShift software and to meet with TCONA people. Genise's January 1996 Monthly Report states that during this month, the AutoShift Shift algorithm was modified to include skip shifting, and was made more adaptive to actual engine braking effectiveness. Markyvech also attended a meeting on January 11 at TCONA in connection with the Top-Two project. Markyvech's January 1996 Report indicates that the skip shift algorithms were developed, and that an adaptive algorithm that monitors the turn off delay of the engine compression brake used on skip upshifts was incorporated into the software.

44. Genise's February 1996 Monthly Report indicates that on February 7, 1996, the modified AutoShift software that included skip shifting was demonstrated. Further, during this month, a

task was added to evaluate a modified pneumatic inertia brake used to speed up shifting, and test software was written that allows the AutoShift truck to be used as the stationary test stand. On February 27, 1996, Genise travelled to Calamus, Michigan to attend a Top 2 team product development meeting. In February, 1996, Markyvech worked on the Top 2 project which was implemented in a Mack truck. Markyvech also continued work on the AutoShift project. On February 15, 1996, Markyvech worked on getting his laptop computer to run the ENG2 diagnostic software. On February 26, 1996, Markyvech worked on AutoShift truck-as-test-stand code. Markyvech's February 1996 AutoShift Support Report indicates that test software was written that allows the AutoShift truck to be used as a stationary test stand. Markyvech's February 1996 Report entitled "Top Two Continued Support" indicates that accomplishments for February 1996 included receiving software and hardware packages for testing and evaluation, and implementing engine controller ENG2 diagnostic software on a desk top PC.

45. Genise's March 1996 Monthly Report - which mistakenly states that it is for the month of February - indicates that on March 26, 1996, a meeting was held to discuss a method of routing pressurized oil from the transmission internal oil pump. The Report also indicates that during March 1996, software regarding the SEL_GEAR module was written, incorporated into the Mack system and tested. Genise's March 1996 report entitled "AutoShift Support" also mentions the oil routing method for the

AutoShift transmission. On March 29, 1996, Genise travelled to Dearborn, Michigan to obtain hardware for the Volvo AutoSplit Truck. Much of Genise's work in March 1996 was spent working on software for the Top Two project. This included work on the select gear module SEL_GEAR on March 14, 15 and 21. Markyvech's March 1996 Report entitled "Mack Top Two Concept Prototype" indicates that the accomplishments for March 1996 included writing and incorporating the SEL_GEAR module. Further, a competitive comparison was prepared for the Mack system versus the AutoShift system. In addition, at the end of March Markyvech worked on the AutoSplit project. Specifically, on March 28-30, Markyvech worked on installing a wiring harness for an AutoSplit system in a test vehicle.

46. Genise's April 1996 Report indicates that during this month an AutoSplit system was installed in a Volvo truck. Genise's April 1996 Report entitled AutoShift Support indicates that a new test was prepared that uses the integral oil pump in the transmission. In the beginning of April 1996, Markyvech worked on installing the AutoSplit wiring harness. On April 22, Markyvech worked on the torque transducer software/calibration. Markyvech also worked on the Mack Top Two towards the end of April. Markyvech's April 1996 Report entitled MACK TOP TWO CONCEPT PROTOTYPE indicates that during April 1996 software coding efforts continued. Markyvech's April 1996 Report entitled "Volvo AutoSplit Retrofit" indicates that the AutoSplit system was installed in a new Volvo vehicle that was supplied to TCONA,

and that repairs were made to the wiring harness during the installation.

47. Genise's May 1996 Monthly Report indicates that approximately 80 percent of the software code needed for the Mack Top Two has been designed, written, compiled and integrated into the bench top system. On May 16, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. On May 22, 1996, Genise made a trip to Mack Truck, Inc. to discuss the Top 2 project. On May 15, Genise prepared a document entitled "Volvo AutoSplit RetroFit" (exhibit). The purpose of this document was to document the efforts on installing the AutoSplit transmission system in a vehicle for demonstration and evaluation purposes. On May 28, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. Further, Genise's May 1996 Report entitled "AutoShift Support" indicates that during this month plans were being made with TCONA to continue testing and development of 25 AutoShift units. Markyvech spent most of his time in May 1996 working on the Mack Top Two. On May 8, 1996, Markyvech performed tests regarding output shaft speed acceleration. On May 14, Markyvech worked on debugging the skid detection routine. Towards the end of May, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. Markyvech's May 1996 Report entitled "Mack Top Two Concept Prototype" indicates that work continued on the software code, and by May 1996 approximately 4.4K bytes of code had been

written. Further, the Report indicates work on testing and debugging of the Top Two software modules.

48. Genise's June 1996 Monthly Report indicates that development on the AutoShift system continued. On June 13, 1996, Markyvech travelled to Southfield, Michigan to obtain supplies for the AutoSplit installation. On June 18, 1996, Genise travelled to Warren, Michigan, in connection with the AutoSplit truck. On July 1, 1996, Genise travelled to Marshall proving grounds for an AutoSplit demonstration. In the beginning of June 1996, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. On June 10, Markyvech worked on the resync portion of the Mack Top Two software code. Markyvech's June 1996 Report entitled "Mack Top Two Concept Prototype" indicates that initial software was approximately 90 percent complete. During the last two weeks of June, Markyvech worked on installing the AutoSplit in a new vehicle for purposes of testing and evaluation. Markyvech's June 1996 Report entitled "AutoSplit Continued Development" also discusses the AutoSplit transmission installation.

X. DISCUSSION

A. Genise Is Entitled To Priority Based On (1) Actual Reduction To Practice Prior To The Filing Date of the Desautels et al '115 Patent And (2) Conception Plus Diligence To Constructive Reduction To Practice

1. Law Of Actual Reduction To Practice

In order to demonstrate an actual reduction to practice for purposes of showing priority in an interference, the device or process must include every essential limitation of the count.

Correge v. Murphy, 217 USPQ 753 (Fed. Cir. 1983). Further, the reduction to practice must show the practical usefulness of the invention. Symmes v. King 21 USPQ 2d 1462 (Fed. Cir. 1991).

In the present case there were multiple reductions to practice of the invention. Specifically, reduction to practices occurred in August 1994, January 1995 and July 1995.

Applicant is submitting herewith the Affidavits of Thomas A. Genise, Ronald K. Markyvech and John Dresden III. These individuals developed, built and tested the AutoSplit automated transmission system. (Genise Affd. ¶11-12, Markyvech Affd. ¶5-8, Dresden Affd. ¶5-7). These Affidavits together with the attached documentary evidence establish that the AutoSplit transmission system was implemented in a Freightliner truck having a ten speed transmission, and that the Freightliner truck having the ten speed AutoSplit transmission successfully completed a three day road test between August 29-31, 1994. (Genise Affd. ¶13, Markyvech Affd. ¶8, Dresden Affd. ¶6). Further, these Affidavits establish that the Freightliner truck having the AutoSplit transmission was successfully demonstrated on January 11, 1995 and July 14, 1995 to engineers of Eaton Corporation's Corporate Research & Development-Detroit Center and of Eaton's Transmission Division. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18).

Applicant is also submitting the Affidavits and attendant documentary evidence of Jon Steeby, Steven Edelen and Warren

Dedow. Steeby, Edelen and Dedow were all familiar with the AutoSplit transmission hardware and software. (Edelen ¶7-8, Dedow Affd. ¶6). Steeby and Dedow attended the demonstration on January 11, 1995 during which they drove the Freightliner truck containing the AutoSplit transmission system. (Steeby Affd. ¶7, Dedow Affd. ¶7). Edelen and Steeby attended the demonstration on July 14, 1995. (Edelen Affd. ¶8 and Steeby Affd. ¶5).

The affidavits and accompanying documents submitted herewith demonstrate that the AutoSplit transmission system was an operable working transmission system on August 29-31, 1994 on January 11, 1995, and on July 14, 1995 - all of which are prior to the July 27, 1995 filing date of the Desautels et al '115 patent. These Affidavits and accompanying documents also establish that the AutoSplit transmission system prototype included every limitation recited in the proposed Counts 1 and 2.

Specifically, the Affidavits and documentary evidence establish that the Freightliner truck with the 10 speed AutoSplit transmission demonstrated on August 29-31, 1994, on January 11, 1995, and on July 27, 1995 each contained: an engine having an output shaft; a multi-speed transmission connected to the engine output shaft; an engine control to control engine fueling of the engine; and an operator input for allowing the operator to signal a desire to eliminate torque between the engine and the transmission (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-8, Edelen Affd. ¶8-11, Dedow Affd. ¶7-8). The evidence also indicates that the engine control determined a zero torque

fuel parameter value for the engine that approximated a zero torque load on the connection between the engine and the transmission; that the engine control operated to control the engine fueling to achieve the zero torque parameter value; and that after the zero torque fuel parameter value was obtained, the transmission was manually moved out of engagement to a neutral position (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-9, Edelen Affd. ¶8-13, Dedow Affd. ¶7-9). Specifically, the software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine speed such that a zero torque condition exists. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if

statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

In the Table below, a comparison between the elements/steps of proposed Counts 1 and 2 and the AutoSplit reduction to practice is provided.

COUNT 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
A method of controlling the operation of a vehicle, comprising the steps of:	The AutoSplit transmission system included a method of controlling the operation of a vehicle.
providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission, and said electronic control unit being operable to calculate the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged;	Exhibit 7 shows an engine having an output shaft. Exhibit 6 shows the engine control which controls the engine output speed. Exhibit 5 shows a multi-speed transmission selectively connected to the engine output saft and operable to convert drive from the engine output shaft through several gear ratios. Function determine_ gear of Exhibit 12 calculated the ratio of the transmission and engine output speeds and determined which gear was currently engaged.

COUNT 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
operating a vehicle using the system provided in step a);	The vehicle using the system in step a) was operated (Markyvech Affd. ¶ 13-17, Genise Affd. ¶ 10-14).
c) determining a currently engaged gear by calculating the ratio of the engine and transmission output shaft speeds, and comparing said calculated ratio to expected ratios;	Based on information from the input and output shaft speed sensors, function determine_gear (Exhibit 12) determined the currently engaged gear by comparing the calculated ratio to expected ratios.
d) determining whether an upshift or a downshift is to be expected as the next shift;	The function get_automatic_gear (Exhibit 12) determined whether an upshift/downshift was next expected.
e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and	Based on receiving the intent-to-shift signal, function control_engine_sync was used to control the engine sync. speed (Exhibit 12). To determine the sync. speed for the next gear, desired_engine_speed was set equal to (int) (gos_signed + sync_offset) where gos = (next gear x current transmission output speed). (Exhibit 12).
f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and	The function control_engine_sync. varied engine speed to approach the sync. speed (Exhibit 12).
g) shifting said multi-speed transmission toward said next expected gear.	Once sync. speed was obtained, the operator manually shifted the transmission to the next gear (Markyvech Affd. ¶ 10-14, Genise Affd. ¶ 13-17).

COUNT 2	**AutoSplit Truck Transmission Concept Prototype" (Reduction To Practice)**
A vehicle drive system comprising:	The AutoSplit system was implemented in a vehicle drive system.
a) an engine having an output shaft;	Exhibit 7 shows an engine having an output shaft.
b) an electronic control unit for controlling the output speed of an engine;	Exhibit 6 shows a electronic control unit which controls engine output speed.
c) a multi-speed transmission operably connected to be driven by said engine output shaft;	Exhibit 5 shows a multi-speed transmission (ten) connected to the engine output shaft.
d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and	The AutoSplit system included a manual stick shaft for shifting the transmission (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14).

COUNT 2	**AutoSplit Truck Transmission Concept Prototype" (Reduction To Practice)**
e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.	Upshift/downshift was initiated when the intent-to-shift switch was depressed while an upshift/downshift was displayed on the display (Genise Affd. ¶ 13-17), Markyvech Affd. ¶ 10-14). Based upon receiving the intent-to-shift signal, the ECU controlled the engine to achieve the speed necessary for the next gear ratio (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14). The shift lever manually moved to neutral when zero torque condition is achieved (Markyvech Affd. ¶ 10-14, Genise Affd. ¶ 13-17, Dresden Affd. ¶ 7-10). When substantial sync. speed was achieved, the shift lever was moved to the next gear (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14, Dresden Affd. ¶ 7-10).

The foregoing clearly establishes an actual reduction to practice of the invention defined in proposed Counts 1 and 2 on August 29-31, 1994, on February 11, 1995 and on July 14, 1995.

2. Conception

As set forth in Mergenthaler v. Scudder, 11 App. D.C. 264, 1897 C.D. 724:

> The conception of the invention consists in the complete performance of the mental part of the inventive act. All that remains to be accomplished in order to perfect the act or instrument belongs to the department of construction, not invention. It is, therefore, the formation in the mind of the inventor of a definite and permanent idea of the

> complete and operative invention as it is thereafter to be applied in practice that constitutes an available conception within the meaning of the patent law.

See also, <u>Coleman v. Dines</u>, 224 USPQ 857 (Fed. Cir. 1985) and <u>Oka v. Youssefyeh</u>, 7 USPQ2d 1169 (Fed. Cir. 1988).

The facts of record indicate a conception of the invention in 1993. A written description of the invention in proposed Counts 1 and 2 are set forth in the Specification-type document (Exhibit A) Genise's presentation materials (Exhibit B), Genise's project proposal (Exhibit C), Genise's specification (Exhibit D), the software code printouts (Exhibits 12 and 18) and the Technical Report (Exhibit 21) - all of which are prior to July 27, 1995 - the filing date of the '115 patent. For purposes of simplifying the analysis of the Technical Report (Exhibit 21) entitled "AutoSplit truck Transmission Concept Prototype" dated February 21, 1995 will be compared relative to the elements/steps of proposed Counts 1 and 2 to demonstrate a conception prior to the '115 patent's filing date of July 27, 1995. This report was approved by Eugene Braun, Genise's supervisor (Exhibit 21, cover page), and was widely distributed to numerous engineers and management personnel at Eaton Corporation (Exhibit 21; Genise Affd. ¶22). Set forth below is the comparison of the elements/steps of proposed Counts 1 and 2 and the February 21, 1995 Technical Report (Exhibit 21).

COUNT 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A method of controlling the operation of a vehicle, comprising the steps of:	Exhibit 21 - Abstract describes a method of controlling a vehicle.
a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission, and said electronic control unit being operable to calculate the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged;	Exhibit 21 - page 5 shows a J1939 data communication line connected "To Engine" which inherently includes an output shaft. Exhibit 21 - pages 4-5 and 7 show an engine controller ECU 2 for controlling an engine speed of the engine output shaft via data communication link J1939 and for calculating the ratio of the transmission and engine output shaft speeds, and determine which gear is currently engaged. Exhibit - page 5 shows a ten-speed transmission which is connected to the engine output shaft.
b) operating a vehicle using the system provided in step a);	Exhibit 21 - Abstract describes operating the vehicle in step (a).
c) determining a currently engaged gear by calculating the ratio of the engine and transmission output shaft speeds, and comparing said calculated ratio to expected ratios;	Exhibit 21 - page 7 describes the ratio determination software routine for calculating the ratio of engine and transmission output shaft speed and comparing the ratio to a table of gear ratios.
d) determining whether an upshift or a downshift is to be expected as the next shift;	Exhibit 21 - Pages 8-9 and Figs. 2-3 describe the shift control algorithms for determining whether an upshift or a downshift is to be expected as the next shift.

COUNT 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
e) determining a desired engine synchronization speed at a next expected gear by determining said next expected gear based upon said currently engaged gear and said expected shift of step d), and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed; and	Exhibit 21 - Pages 8 and 9 and Figs. 2 and 3 show that the next expected gear is based upon the currently engaged gear.Page 14 describes that desired engine sync speed at the next expected gear is determined by GOS which is the next expected gear G multiplied by the output shaft OS speed of the transmission.
f) beginning to control said output speed of said engine output shaft to approach said synchronization speed; and	Exhibit 21 - Page 8 describes the control algorithm which controls the engine output shaft speed to approach sync speed GOS
g) shifting said multi-speed transmission toward said next expected gear.	Exhibit 21 - Fig. 1 shows the manual shift lever, and page 6 describes shifting the transmission to the next expected gear.

COUNT 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A vehicle drive system comprising:	Exhibit 21 - Abstract describes a vehicle drive system.
a) an engine having an output shaft; b) an electronic control unit for controlling an output speed of said engine.	Exhibit 21 - page 5 shows a J1939 data communication line connected "To Engine" which inherently includes an output shaft. Pages 4-5 and 7 show an engine controller ECU 2 for controlling engine speed.

COUNT 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
c) a multi-speed transmission operably connected to be driven by said engine output shaft;	Exhibit 21 - page 5 shows a ten-speed transmission which is connected to the engine output shaft.
d) a manual stick shift to allow an operator to change the speed ratios of said transmission; and	Exhibit 21- page 5 shows a manual stick shift for allowing an operator to change speed ratios of the ten-speed transmission
e) a driver shift intent switch to allow a driver to send a signal to said electronic control unit of whether an upshift or a downshift is to be next expected, said electronic control unit being operable to determine a currently engaged gear, determine a next expected gear based upon said currently engaged gear and said driver shift intent signal, determine a synchronization speed for shifting to said next expected gear, and change said engine speed to move toward said synchronization speed when a shift is being made.	Exhibit 21 - Page 2 describes the intent to shift switch feature for sending a signal to the electronic controller ECU2 (page 28) indicating that an upshift or a downshift is the next expected gear. The ECU2 determines the currently engaged gear, and based on receiving the intent to shift signal, determines an upshift or a downshift is the next expected gear. The ECU 2 also determines a sync speed for shifting to the next gear, and controls engine speed towards the sync speed when a shift is made. (Pages 6-9 and Figs. 2-3).

As is apparent, Genise's February 21, 1995 Technical Report entitled "AutoSplit Truck Transmission Concept Prototype" includes every feature set forth in proposed Counts 1 and 2, and therefore constitutes a complete conception of the invention.

3. Diligence

Diligence consists of activity directed toward reduction to practice of an invention or overcoming obstacles to reduction to practice. Diligence must be shown during the "critical period", i.e., from just before entry of the rival inventor into the field, to actual or constructive reduction to practice. Moller v. Harding, 214 USPQ 724 (Bd. Pat. Int. 1982). During the critical period there must be "reasonably continuous activity". Burns v. Curtis, 80 USPQ 587 (CCPA 1949).

In the present case the critical period begins just before July 27, 1995, the filing date of the Desautels et al '115 patent. It ends with Genise's constructive reduction to practice on June 19, 1996, the date the subject application was filed in the Patent Office. The facts of record show continuous diligence during this critical period.

During the period of time from the beginning of July 1995 through the end of June 1996, Eaton Corporation Corporate Research & Development Center in Detroit, Michigan (CORD-DC) had an automated transmission development program for heavy duty vehicles. (Genise Affd. ¶24, Markyvech Affd. ¶19). Eaton's automated transmission program included related projects under the names "AutoShift","AutoSplit" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶19). These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal (Genise Affd. ¶24, Markyvech Affd. ¶19). Each of these

projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

In the present case, the record shows that Genise and Markyvech - under the supervision of Genise - continuously worked during the critical period on implementing the invention defined by proposed Counts 1 and 2 in a heavy duty truck driveline. Besides supervising Markyvech in connection with the transmission automation projects, Genise designed the system and software requirements including algorithm design, and determined system requirements. (Genise Affd. ¶24-30). In addition, Genise prepared specification requirements, project/program plans, and technical reports in connection with the automated transmission program. (Genise Affd. ¶24-30). Markyvech's work concentrated primarily on software development and testing. (Markyvech Affd. ¶4 and 19). However, Markyvech also developed and tested the electrical system needed for communicating between the engine Electronic Control Unit (ECU), the transmission ECU and the various system sensors, including the input and output shaft speed sensors. (Markyvech Affd. ¶4 and 19). Markyvech also tested the J1939 data communication link between the engine and transmission ECUs. (Markyvech Affd. ¶4 and 19). Further, the record shows that John Dresden III, under the supervision of both Genise and Markyvech built transmissions, assembled prototypes from stock transmissions, built and installed electrical and mechanical transmission components, such as hoses, sensors, brackets, ECUs,

and tested transmissions including recording and obtaining data. (Dresden Affd. ¶4-5). The time records for Genise, Markyvech and Dresden show continuous work on developing the AutoSplit/AutoShift/Top Two transmission systems.

Cumulative Time For Genise, Markyvech and Dresden Between July 1995-June 1996	
July '95	194.5 hours
Aug. '95	285.5 hours
Sept. '95	329.0 hours
Oct. '95	375.0 hours
Nov. '95	364.5 hours
Dec. '95	233.5 hours
Jan. '96	286.5 hours
Feb. '96	261.5 hours
Mar. '96	284.5 hours
Apr. '96	258.0 hours
May '96	274.0 hours
June '96	219.5 hours
Total	3,366.0 hours

All of the above show continuous diligence with respect to developing a product implementing the present invention well before July 27, 1995, and continuing past June 19, 1996.

4. Corroboration

Corroboration consists of a rule of reason determination of whether the evidence as a whole supports the claimed invention. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). The purpose of the corroboration requirement is to prevent fraud. Velsicol Chemical Corp. v. Monsanto Co., 579 F.2d 1038 (7th Cir. 1978).

Evidence corroborating priority may be documentary or oral. Bell Telephone Laboratories v. Hughes Aircraft Co., 565 F.2d 654, 657 (3d Cir. 1977), cert. denied 435 U.S. 924 (1978). In determining whether evidence of an invention has been sufficiently corroborated, courts apply a rule of reason approach, performing a reasonable analysis of the total evidence. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). Corroboration therefore turns on the facts when viewed as a whole. Moreover, corroborative evidence need not consist of an actual witnessing of the reduction to practice -- circumstantial evidence alone can satisfy the corroboration requirement. Id. at 776.

In the present case, the reduction to practice of the invention between August 29-31, 1994 is corroborated by Markyvech and Dresden. The reductions to practice on January 11, 1995 is corroborated by Markyvech, Steeby and Dedow. The reduction to practice on July 14, 1995 is corroborated by Steeby and Edelen, as well as by the later document prepared by William Batten which provides the minutes of the July 14, 1995 transmission automation meeting. The August 1994 and January 1995 reduction to practice is also corroborated by documents including the February 21, 1995 Technical Report for the AutoSplit Truck Transmission which indicates that the AutoSplit transmission system was successfully tested and demonstrated. (Exhibit 21).

Exhibit 21 provides a conception of the invention which is corroborated by the Affidavits of Markyvech, Dedow, Edelen and Steeby. Each of these individuals received a copy of Genise's

February 21, 1995 Technical Report detailing the invention defined in Counts 1 and 2.

XI. CONCLUSION

The evidence of record proves <u>prima</u> <u>facie</u> that Genise is entitled to priority relative to the July 27, 1995 filing date of the Desautels et al '115 patent based on:

(a) prior reduction to practices of the subject matter defined in proposed Counts 1 and 2 on August 29-31, 1994, January 11, 1995 and July 14, 1995; and

(b) prior conception plus diligence to the constructive reduction to practice date of June 19, 1996 (the filing date of the subject application).

Accordingly, the Examiner is respectfully requested to declare an interference between U.S. Patent No. 5,569,115 and the present application No. 08/666,164 pursuant to Applicant's Request under 37 CFR §1.607(a).

Respectfully submitted,

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Date: August 29, 1997

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#13

In re the Application of

THOMAS A. GENISE

Application No: 08/666,164 Group Art Unit: 3502

Filed: June 19, 1996 Examiner: T. Kwon

For: AUTOMATED TRANSMISSION SYSTEM CONTROL WITH ZERO ENGINE FLYWHEEL TORQUE DETERMINATION

FOURTH REQUEST FOR INTERFERENCE PURSUANT TO 37 C.F.R. § 1.607

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I. INTRODUCTION

Applicant hereby requests the declaration of an interference between this application Serial No. 08/666,164 to Genise ("Genise '164 application") and U.S. Patent No. 5,573,588 to Palmeri et al ("Palmeri '558 patent"). This request for interference is made in accordance with the provisions of 37 CFR §§ 1.607 and 1.608, and as specified therein sets forth among other things: (1) Counts for the Interference; (2) a showing that the Palmeri '558 patent contains claims that correspond to the Counts; (3) a showing that the Genise '164 application contains claims that correspond to the Counts; and (4) a detailed explanation of Genise's right to priority, supported by Declarations and documentary evidence.

II. THE SUBJECT MATTER IN ISSUE

The subject matter of this potential interference deals with a vehicle drive system which includes a speed control that assists

an operator in shifting the transmission without requiring the disengagement of the manual clutch, or manual synchronization of engine speed. The system determines whether an upshift or a downshift is to be expected, and after the transmission has been shifted to neutral, controls the engine speed to approach a synchronization speed for the next gear. In order to ensure that the synchronization speed is achieved and to ensure full engagement of the engaging jaw clutches, the system varies the engine speed above and below the sync. speed, or adds an offset to the actual sync. speed. Once the approximate sync. speed is obtained, the operator can manually shift the transmission to the next gear.

III. THE INVOLVED PATENT AND APPLICATION

U.S. Patent No. 5,582,558 ("the Palmeri et al '558 patent") issued to Palmeri et al on December 10, 1996.

The present application U.S. Appln. No. 08/666,164 to Thomas A. Genise (The Genise '164 application) was filed on June 19, 1996. By the Amendment filed concurrently herewith, Applicant has amended the specification to indicate that the Genise '164 application is a continuation application of U.S. Appln. Nos. 08/649,830, 08/649,831 and 08/649,833, each filed April 30, 1996. Further, Applicant is adding new claims 132-140 which correspond exactly to claims 5-10, 20 and 28-29 of the Palmeri et al '558 patent.

IV. THE PROPOSED COUNTS FOR INTERFERENCE

In accordance with 37 CFR §1.607(a)(2), Applicant proposes Counts 1 and 2 set forth below. Counts 1 and 2 define a method of controlling the operation of a vehicle drive. The proposed Count 1 corresponds exactly to the Palmeri '558 patent claim 5 and to Genise '164 application claim 132. The proposed Count 2 corresponds exactly to Palmeri '558 patent claim 28 and to Genise '164 application claim 139.

<u>COUNT 1</u>

A method of controlling the operation of a vehicle comprising the steps of:

(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;

(b) operating a vehicle using the system provided in step (a);

(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;

(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);

(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;

(f) varying said engine output speed above and below said synchronization speed such that said engine output speed periodically crosses an actual required synchronization speed for said transmission; and

(g) manually shifting said multi-speed transmission towards said next expected gear.

COUNT 2

A method of controlling the operation of a vehicle comprising the steps of:

(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;

(b) operating a vehicle using the system provided in step (a);

(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;

(d) determining a next expected gear based upon said currently engaged gear and said expected shi[f]t of step (c);

(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;

(f) adding an offset to said synchronization speed, and begin varying said engine output speed to approach said synchronization speed, with said offset; and

(g) manually shifting said multi-speed transmission towards said next expected gear.

V. DESIGNATION OF CLAIMS CORRESPONDING TO THE COUNTS

1. Identification of Claims In
The Palmeri et al '558 Patent
Corresponding To Proposed Counts 1 and 2

In accordance with 37 CFR §1.607(a)(3), Applicant identifies claims 1-27 of the Palmeri et al '558 patent as

corresponding to proposed Count 1. The proposed Count 1 is claim 5 of the Palmeri et al '558 patent. All of the claims 1-27 of the Palmeri et al '558 patent are proposed to correspond to Count 1 because they all define the same patentable invention.

Applicant identifies claims 28-34 as corresponding to proposed Count 2. The proposed Count 2 is claim 28 of the Palmeri et al '558 patent. All of the claims 28-34 of the Palmeri et al '558 patent are proposed to correspond to Count 2 because they all define the same patentable invention.

2. Offer of Claims In This Application Corresponding <u>To Proposed Counts 1 and 2</u>

In accordance with 37 CFR §1.607(a)(4), Applicant submits that claims 132-138 of the Genise '164 application correspond to proposed Count 1, and that claims 139-140 of the Genise '164 application correspond to proposed Count 2.

VI. SUPPORT FOR CLAIMS 132-140 OF THE GENISE '164 APPLICATION

In the Table below Applicant has applied each of the new claims 132-140 to the specification pursuant to 37 CFR §1.607(1)(5)(ii).

Claims 132-140	**Specification of U.S. Appln. No. 08/666,164**
132. A method of controlling the operation of a vehicle comprising the steps of:	Fig. 3 shows a method of controlling the operation of a vehicle.

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Fig. 3 shows an engine 102 having an output shaft, and an engine controller 112 for controlling the speed of the output shaft. Fig. 3 also shows that the engine output shaft is connected to drive a multi-speed transmission 10 through master clutch 104. The engine controller 102, 148 receives information regarding the currently engaged gear and calculates the speed ratio at the next expected gear and determines the sync. speed for the next gear (Fig. 4; page 10, line 15 - page 12, line 12).
(b) operating a vehicle using the system provided in step (a);	The vehicle shown in Fig. 3 is operated.
(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	The system controller 112, 148 determines the currently engaged gear, and whether an upshift or a downshift is expected as the next shift based upon system operating conditions (page 10, line 15 - page 12, line 12; Fig. 4).
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	The system controller 112, 148 determines the next expected gear based on the current gear and the expected shift (page 10, line 15 - page 12, line 12).

Claims 132-140	**Specification of U.S. Appln. No. 08/666,164**
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	After the transmission is confirmed to be in neutral, the system controller 112, 148 controls engine fueling to achieve engine sync. Engine sync is identified by multiplying the speed ratio of the next expected gear with the current transmission output speed (page 10, lines 20-25).
(f) varying said engine output speed above and below said synchronization speed such that said engine output speed periodically crosses an actual required synchronization speed for said transmission; and	Page 12, lines 25-30 of the '164 appln. cites 5,508,916 which teaches dithering above and below actual sync. speed (i.e., periodically crosses actual sync. speed).
(g) manually shifting said multi-speed transmission towards said next expected gear.	Fig. 3 shows stick shift lever 57 for manually shifting the transmission (page 12, lines 4-12).
133. A method as recited in claim 132, further including the step of providing an offset to said desired engine synchronization speed of a set value such that said engine synchronization speed and said actual engine speed do not match identically for any lengthy period of time.	When synchronizing to engage a target ratio, engine 102 is directed to remain at a speed that is a value above or below true synchronous speed (page 11, lines 1-5).

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
134. A method as recited in claim 132, wherein said electronic control unit periodically determines said currently engaged gear by monitoring the actual output speed of said engine and the actual output speed of the transmission, determining an actual speed ratio, comparing said actual speed ratio to expected ratios in a reference table, and updating a memory for said currently engaged gear if said determined currently engaged gear differs from that in said memory.	The engine controller 112, 146 periodically determines the engaged gear by monitoring engine output speed and transmission output speed, determines the speed ratio, compares the speed ratio to expected ratios, and updates memory (page 10, lines 27-31; Fig. 2 and Figs. 5A-5D).
135. A method as recited in claim 134, wherein the determination of said currently engaged gear is made prior to the movement to neutral of step (c).	The currently engaged gear is determined prior to neutral (page 10, lines 27-31).
136. A method as recited in claim 132, wherein the determination of an upshift or downshift of step (c) is taken from an operator intent switch.	Page 1, ln. 23 of the '164 appln. incorporates by reference U.S. Pat. No. 4,361,060 which shows (Fig. 1) up (U) and down (D) positions of shift control 26 and Fig. 4 shows gear counter circuit 113 and the up (MUP) and down (MDN) driver control signals (see, also col. 11, lns. 37-40 of 4,361,060). Further, pg. 1, ln. 23 incorporates by reference U.S. Pat. No. 4,648,290 which discloses (Fig. 3) gear selector 1 which includes up/down shift requests (col. 6, lns. 25-38 of the '290 patent).

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
137. A method as recited in claim 136, wherein said operator intent switch is combined with an operator torque elimination request switch, and said electronic control unit reducing the torque load between said engine and said transmission upon receiving a torque elimination request signal.	shift knob 118 includes an intent-to-shift button 120. Controller 146 issues commands to engine controller 112 to relieve torque lock by fuel manipulation upon receiving the intent-to-shift signal (ITS) (pg. 12, lns. 13-24; '290 patent Fig. 10).
138. A method as recited in claim 132, wherein said stick shift controls components within said transmission to manually move said components to change a speed ratio.	Fig. 3 shows stick shift 57 for manually moving components in the transmission to change a speed ratio (pg. 11, lns. 31 - pg. 12, ln. 3).
139. A method of controlling the operation of a vehicle comprising the steps of:	Fig. 3 shows a control operation of a vehicle.
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Fig. 3 shows an engine 102 having an output shaft, and electronic controller 112, 146 for controlling engine output shaft speed (pg. 12, lns. 15-18). The engine output shaft is connected to multi-speed transmission 10 through master clutch 104. The engine controller 112, 148 receives information of the currently engaged gear and calculates the next expected gear and determines a sync. speed for the next gear based on speed ratios at the next gear and the transmission output gear (pg. 10, ln. 4 - page 13, ln. 12; Fig. 4).

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
(b) operating a vehicle using the system provided in step (a);	Fig. 3 shows a system 100 for operating a vehicle.
(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	The currently engaged gear is determined and whether an upshift or downshift is expected to be the next shift (Fig. 4; pg. 10, ln. 4 - pg. 13, ln. 12).
(d) determining a next expected gear based upon said currently engaged gear and said expected shirt of step (c);	The next gear is determined based on the current gear and the expected shift (Fig. 4; pg. 10, ln. 4 - pg. 13, ln. 12).
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	As seen as neutral is sensed, the engine is commanded to a sync. engine speed for the target gear ratio ES by multiplying the speed ratios at the target gear GR_T with the current transmission output shaft speed OS to control the output speed to approach the sync. speed (pg. 10, lns. 20-23).
(f) adding an offset to said synchronization speed, and begin varying said engine output speed to approach said synchronization speed, with said offset; and	An offset E_{RROR} is added to the sync. speed, and engine speed is commanded to the sync. speed with the offset (pg. 10,lns. 20-23; pg. 11, lns. 1-8).
(g) manually shifting said multi-speed transmission towards said next expected gear.	Stick shift 57 (Fig. 3) is used to manually shift transmission 10 to the next gear.

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
140. A method of controlling the operation of a vehicle comprising the steps of:	Fig. 3 shows a control operation for a vehicle.
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed, and a driver shift intent signal to allow a driver to provide an indication of the next expected shift direction;	Fig. 3 shows an engine 102 having an output shaft, an electronic controller 112, 146 for controlling engine output shaft speed (pg. 12, lns. 15-18). The engine output shaft is connected to multi-speed transmission to thrash master clutch 104. The engine controller 112, 148 receives information of the currently engaged gear and calculates the next expected gear and determines a sync. speed for the next gear based on speed ratio at the next gear and the transmission output gear (pg. 10, ln. 4 - pg. 13, ln. 12; Fig. 4). Page 1, ln. 23 of the '164 appln. incorporates by reference U.S. Pat. No. 4,361,060 which shows (Fig. 1) the up ("U") and down ("D") positions of shift control 26 and Fig. 4 shows gear counter circuit 113 and the up (MUP) and down (MDN driver control signals. See also col. 11, lns. 37-40 of the '060 patent. Further, pg. 1, ln. 23 incorporates by reference U.S. Pat. No. 4,648,290 which discloses (Fig. 3) gear selector 1 which includes up and down shift requests (col. 6, lns. 25-38 of the '290 patent).

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
(b) operating a vehicle using the system provided in step (a);	Fig. 3 shows a system 100 for operating a vehicle.
(c) determining the currently engaged gear, and the predicted shift direction based upon said driver shift intent switch;	The currently engaged gear is determined by comparing input shaft/output shaft rotational speeds to known gear ratios. U.S. Patent Nos. 4,361,060 and 4,648,290 (both incorporated by reference on pg. 1, ln. 23) disclose determining the predicted shift direction based upon a driver intent switch.
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	U.S. Pat. Nos. 4,361,060 and 4,648, 290 both disclose determining the next gear based on the current gear and the expected shift. Pg. 10, ln. 27 - pg. 13, ln. 7 disclose determining a next gear based on the current gear and the expected shift (Fig. 4).
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	As soon as neutral is sensed, the engine is commanded to the sync. engine speed for the target or next gear ratio ES by multiplying the ratio at the target gear GR_T with the current transmission output shaft OS to control the output speed to approach the sync. speed (pg. 10, lns. 20-23).

Claims 132-140	Specification of U.S. Appln. No. 08/666,164
(f) receiving a change in the driver shift intent from said operator switch, after step (e), and recalculating said next expected gear based upon said change driver shift intent, and determining a new synchronization speed based upon said changed driver shift intent;	The '290 patent and U.S. Pat. No. 4,595,986 (incorporated by reference) teaches a microprocessor which changes ore recalculates the system parameters if the driver shift intent changes.
(g) moving said engine output speed to approach said synchronization speed; and	The engine speed is commanded to the sync. speed (pg. 10,lns. 20-23).
(h) manually shifting said multi-speed transmission towards said next expected gear.	Stick shift 57 (Fig. 3) is used to manually shift transmission 10 to the next gear.

VII. THE BURDEN OF PROOF

Since the Genise '164 application was filed more than three months after the filing date of the Palmeri '558 patent, Genise's burden is to establish <u>prima facie</u> entitlement to priority relative to the Palmeri et al '558 patent's filing date of July 27, 1995. 37 CFR §1.608(b).

VIII. SUMMARY OF GENISE'S POSITION

In support of his showing of priority, Genise submits herewith Affidavits of Thomas A. Genise, Ronald K. Markyvech, Warren R. Dedow, John Dresden III, Jon Steeby, James McReynolds and Steve Edelen together with contemporaneous documentary exhibits. This

evidence will show the following:

1. Thomas Genise is an engineer at Eaton Corporation's Corporate Research & Development Center in Detroit, Michigan (CORD-DC) in the automated transmission development program for heavy duty vehicles. Since 1976 Ron Markyvech has worked for CORD-DC, and has been a senior product engineer since 1990. Since 1990 James McReynolds has worked for Eaton Corp. as head of Product Planning and Strategic Planning for North America.

2. The automated transmission development program of Eaton Corporation included related automated transmission projects under the names "AutoShift", "AutoSplit" and "Top Two". These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral, and for thereafter automatically controlling the engine fueling to achieve the synchronization speed for the next gear. Further, each of these projects included the feature of dithering about the synchronization speed to ensure that the actual engine fueling periodically crosses the synchronization speed

level.

3. With the assistance of Ronald Markyvech and John Dresden III, Thomas Genise designed, developed, built and tested the AutoSplit multi-speed transmission system.

4. The AutoSplit transmission was implemented in a Freightliner truck having a ten speed transmission.

5. The Freightliner truck having the ten speed AutoSplit transmission included the subject matter defined in Counts 1 and 2, and successfully completed a three day road test between August 29-31, 1994. Thomas Genise, Ronald Markyvech and John Dresden all participated in the August 29-31, 1995 road trip.

6. The Freightliner truck having the ten speed AutoSplit transmission was successfully demonstrated at Eaton Corporation's proving grounds in Marshall, Michigan, on January 11, 1995. Eaton engineers John Steeby and Warren Dedow who were familiar with the AutoSplit transmission including its software code structure, attended the demonstration and actually drove the Freightliner truck.

7. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Truck Transmission Concept Prototype. This Technical Report described the invention defined in Counts 1 and 2, and was widely distributed to Eaton engineers and members of Eaton's upper management.

8. On July 14, 1995, Eaton Corporation held an "Automation

Strategic Planning Meeting" at Eaton's Proving Grounds in Marshall, Michigan. At this meeting trucks with automated transmissions including the AutoSplit, AutoShift and Top Two transmissions were demonstrated to several Eaton engineers and members of upper management. Thomas Genise successfully demonstrated the Freightliner truck having the ten speed AutoSplit transmission at the July 14, 1995 Meeting. As part of these demonstrations, the attenders were given rides on the Freightliner truck and also were able to actually drive the truck.

9. From prior to July 27, 1995 to the filing date of the Genise '164 application on June 19, 1996, Thomas Genise and Ron Markyvech continuously worked on Eaton's AutoSplit/AutoShift/Top Two automated transmission systems for commercial application. This work included supervising mechanical technician John Dresden III.

10. The '164 patent application was filed on June 19, 1996.

As discussed below, the Genise proofs demonstrate that Applicant is prima facie entitled to priority relative to the Palmeri '558 patent filing date of July 27, 1995 based on:

1. Actual reduction to practice in August, 1994, January 1995 and July 1995; and
2. Conception plus diligence from prior to July 27, 1995 to a constructive reduction to practice on June 19, 1996.

IX. STATEMENT OF FACTS

1. Since January of 1982, Thomas Genise has worked as an engineer for Eaton Corporation in the Corporate Research and Development - Detroit Center (CORD-DC) in the automated transmission development program for heavy duty vehicles. (Genise Affd. ¶3).

Since July 1976, Ron Markyvech has worked as an engineer for Eaton Corp. at CORD-DC in the automated transmission development program for heavy duty vehicles. (Markyvech Affd. ¶3).

Since 1990 James McReynolds has worked for Eaton Corporation at TACONA as the head of Product Planning and Strategic Planning for North America. (McReynolds Affd. ¶3).

2. In early 1993, McReynolds conceived of a partially-automated transmission system which would be easier to drive than a manual transmission system, but which would be considerably less expensive than a fully automatic transmission system which does not contain a shift lever. (McReynolds Affd. ¶4). In conceiving the transmission system McReynolds realized that considerable expense is associated with eliminating the shift lever of a transmission system. McReynolds conceived of a partially automated transmission system which maintains the shift lever - thereby reducing the cost of the system - but which allows the driver to shift gears without disengaging the master clutch and without manipulating the throttle pedal. (McReynolds

Affd. ¶4-5). On August 11, 1993, McReynolds faxed a specification-type document (Exhibit A) to Eaton's patent counsel, Howard D. Gordon. Exhibit A describes a partially automated transmission system which provides clutchless and throttleless shifting with a shift lever. The shift lever includes a switch at the top of the knob which when depressed causes the engine fueling to be controlled so as to minimize torque between the engine and the transmission thereby allowing the operator to shift into neutral. Thereafter, the system controlled the engine to achieve the synchronization speed of the next gear, allowing the operator to easily shift into the next gear.

3. Sometime in August 1993, McReynolds called Tom Genise to discuss the possibility of Genise developing the partially automated transmission system which McReynolds named "AutoStick". (McReynolds Affd. ¶7). Specifically, McReynolds explained to Genise that the "AutoStick" transmission would include a shift lever, a shift button which the driver would depress in order to upshift or downshift. In response to depressing the button, the system would automatically control engine fueling to minimize torque, thereby allowing the driver to move the shift lever to neutral without using the clutch pedal, and after sensing neutral, the system would automatically control engine fueling to approach the synchronization speed for the next gear, thereby

allowing the driver to move the shift lever to the next gear without manipulating the throttle. (McReynolds Affd. ¶8-9). On September 7, 1993, McReynolds faxed the specification-type document (Exhibit B) to Genise. (Genise Affd. ¶8).

4. Genise renamed AutoStick as "AutoSplit", and on November 15, 1993, Genise sketched on an electronic white board three options of how AutoSplit could be implemented during a meeting at CORD-DC (Genise Affd. ¶9). Exhibit C is a copy of those three sketches. Options 1, 2 and 3 show a manual transmission, a display unit for displaying the different gear ratios, an engine control unit for controlling the engine and a stick shift having a switch pad (options 1 and 3) or up/down buttons (options 2) for initiating the shift. Genise explained that in response to the driver depressing the switch pad or up/down buttons, the engine control unit controls engine fueling so as to reach a zero torque level, thereby allowing the driver to move the shift lever to the neutral position. Genise further explained that after neutral was sensed, the engine control would control engine fueling to approach the synchronization speed for the next gear (Genise Affd. ¶9).

5. On December 9, 1993, Genise prepared a project proposal for a concept AutoSplit, called "Electronically Enhanced Super 10". Exhibit D is a copy of the December 9, 1993 proposal. Exhibit D includes several options for implementing AutoSplit

including different versions of the intent-to-shift switch.

6. On May 13, 1994, Genise prepared with the assistance of W. M. Mack an "AutoSplit Specification for the Concept Prototype". Exhibit E is a copy of the specification which includes a description of the different engine control routines for the system. Specifically, section 5.5.4 of Exhibit E describes the "predip" mode during which the AutoSplit algorithm fuels the engine to provide zero driveline torque, and a "sync" mode which occurs when neutral is sensed and which commands the engine to approach the synchronization speed for the newly selected gear.

7. Between May 1994 and July 1995 Eaton's automated transmission program included, besides AutoSplit, related automated transmission projects under the names "AutoShift" and "Top Two". (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All three of these projects were transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). All of these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. (Genise Affd. ¶24, Markyvech Affd. ¶18-19). Specifically, each of these projects included software for automatically controlling the

engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

8. In May 1994, construction of a AutoSplit automated transmission prototype began. (Genise Affd. ¶11, Markyvech Affd. ¶6). Thomas Genise, Ron Markyvech and John Dresden III were the personnel at CORD-DC working on the AutoSplit project at this time (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Tom Genise was the system engineer for the AutoSplit project, Ron Markyvech was the software engineer for the project, and John Dresden III was the driver/mechanic for the project (Genise Affd. ¶11-12, Markyvech Affd. ¶4-7, Dresden Affd. ¶4-5). Exhibit 1 is a copy of a May 1994 project report prepared by Ron Markyvech and entitled "AUTOSPLIT CONCEPT PROTOTYPE" which included a general description of the AutoSplit transmission, and the work that was planned for the project. The project report shows that the object of the project was to design and build a concept prototype transmission to demonstrate the AutoSplit concept.

9. In August of 1994, a prototype of the AutoSplit transmission system was completed and implemented in a ten speed Freightliner truck. (Genise Affd. ¶11, Markyvech Affd. ¶8, Dresden Affd. ¶6). This AutoSplit prototype was successfully tested during a three day extensive road trip between August 29-31, 1994. (Genise Affd. ¶11 and 13, Markyvech Affd. ¶8, Dresden

Affd. ¶6). The three day trip originated from Southfield, Michigan and included stops at Marshall, Michigan and Traverse, Michigan. The test driving team included Tom Genise, Ron Markyvech and John Dresden III. (Genise Affd. ¶12, Markyvech Affd. ¶8, Dresden Affd. ¶6). Exhibit 2 is a copy of a August 1994 Project Report for the AutoSplit project which mentions the August 29-31, 1994 AutoSplit road trip. Exhibit 3 is a copy of Ron Markyvech's Travel and Business Expense Report for the August 29-31, 1994 road trip. At the top right hand corner of the Expense Report, there is an indication that the expenses occurred from August 29 to August 31, 1994. Towards the bottom half portion of the Expense Report next to the heading "Purpose of Trip:", there is the notation "Project #5956-01 AutoSplit Concept Transmission Development Road Trip". Project #5956-01 was the project number for the AutoSplit project. (Markyvech Affd. ¶9). In the section explaining the day by day expenditures, there is an indication that Ron Markyvech paid for the meals of Tom Genise and John Dresden III.

10. The AutoSplit transmission system prototype that was successfully tested between August 29-31, 1994 was implemented in a Freightliner truck. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The Freightliner truck included an engine, an engine output shaft, an engine Electronic Control Unit (ECU) for controlling the engine speed and other engine parameters, a

transmission ECU for controlling the engine ECU through a SAE J-1939 communication data link, a ten-speed transmission, a master clutch connected between the engine and the transmission, and a clutch pedal for controlling the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Exhibit 4 is a block diagram of the AutoSplit transmission system which was prepared by Ron Markyvech prior to January 1995, and is an accurate representation of the prototype tested between August 29-31, 1994. (Markyvech Affd. ¶10). Exhibit 4 shows a manual ten speed transmission, an engine control unit ECU2 connected to the engine via a J1939 data communication link input and output shaft sensors, a display unit for displaying the ten different gear ratios, and an intent-to-shift switch mounted on the shift lever and connected to the engine control unit.

11. The Freightliner truck also included transmission input and output shaft speed sensors, a manual stick shift for allowing the driver to manually shift the transmission between the ten different speed ratios, a display panel mounted on the shift lever for displaying the presently engaged gear and the appropriate next gear, and a laptop computer which acted as an operator intent-to-shift control switch or button for sending a signal to the transmission ECU indicating whether an upshift or a downshift is to be initiated as the next gear shift, and for requesting that the engine be fueled to minimize driveline torque

thereby allowing easy disengagement of an engaged ratio without requiring disengagement of the master clutch. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

12. An upshift was initiated when the operator depressed keys of the keyboard of the laptop computer while an upshift was being displayed on the display, and a downshift was initiated when the operator depressed keys while a downshift was being displayed. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). The operator intent to shift signal from the depressed keys of the keyboard initiated the upshift or the downshift by first signalling to the transmission ECU a desire to eliminate or minimize torque between the engine output shaft and the transmission output shaft. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7). Based upon receiving the operator intent to shift signal, the transmission ECU modified the engine fueling to reduce torque to the transmission without disengaging the master clutch. The operator could then easily shift the transmission to neutral. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

13. Based upon receiving the intent to shift signal, and after sensing that the transmission was shifted to neutral, the transmission ECU then controlled the engine to achieve a determined engine speed necessary for the next gear ratio. (Genise Affd. ¶13, Markyvech Affd. ¶10, Dresden Affd. ¶7).

14. Exhibits 5-11 are photocopies of photographs of the actual hardware elements used during the August 29-31, 1994 trip. Specifically, Exhibit 5 is a photograph of the actual ten-speed transmission used in the test. Exhibit 6 is a photograph of the actual transmission ECU, Exhibit 7 is a photograph of the actual engine and engine ECU, Exhibit 8 is a photograph of the actual electrical wiring harness, Exhibit 9 is a photograph of the actual display panel which was mounted on the shift lever, Exhibit 10 is a photograph of the actual master clutch foot pedal, and Exhibit 11 is a photograph of the actual truck used during the August 29-31, 1994 trip. (Genise Affd. ¶14, Markyvech Affd. ¶11, Dresden Affd. ¶8).

15. The AutoSplit transmission system tested during the August 29-31, 1994 trip included several software engine control routines. These software routines were implemented in the transmission ECU. (Genise Affd. ¶15, Markyvech Affd. ¶12). Exhibit 12 is a printout of the actual software code contained in the transmission ECU during the August 29-31, 1994 test trip. The front page of Exhibit 12 identifies the dates of the various files contained in the software program, with the latest date being August 29, 1994. With the assistance of Tom Genise, Ron Markyvech wrote the software program of Exhibit 12 which is written in "C" computer language. (Genise Affd. ¶15, Markyvech Affd. ¶12).

16. One of the several software engine control routines of Exhibit 12 is able to predict or determine zero flywheel torque based on system variables, and then modify engine speed to achieve the zero torque condition. (Genise Affd. ¶16, Markyvech Affd. ¶13). The zero torque condition enables the driver to easily move the transmission out of gear engagement and into the neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶16, Markyvech Affd. ¶13). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶15, Markyvech Affd. ¶13). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine fueling such that a zero torque condition exists. (Genise Affd. ¶16, Markyvech Affd. ¶13). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶16, Markyvech Affd. ¶13). During the test road trip of August 29-31, 1994, the laptop Personal Computer (PC) was connected to the communication data link of the AutoSplit system. (Genise Affd. ¶16, Markyvech Affd. ¶13). This allowed the PC to display the predicted torque percentage for achieving zero flywheel torque. (Genise Affd. ¶16, Markyvech

Affd. ¶13). During testing on the road trip, function intent_final_pct_trq was commanded to equal the predicted torque percentage as well as other torque percentages. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the zero torque condition existed, the transmission was manually moved out of gear engagement and into a neutral position. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function determine_gear from module trns_act.c96 determined when the transmission moved to the neutral. (Genise Affd. ¶16, Markyvech Affd. ¶13).

17. The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

18. The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

19. During the August 29-31, 1994 road trip, the AutoSplit transmission system was extensively tested by

monitoring data on the PC. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). In particular, the testing included monitoring the torque values after the intent-to-shift switch was recognized by the transmission ECU; monitoring when the transmission was shifted into neutral; monitoring and evaluating the various engine control parameters in different modes of operation (including the torque control mode and speed control mode); and monitoring the transmission input shaft speed. The testing also included evaluating data at the time the transmission shifted into gear and considering the "feel" of the shift for purposes of determining shift quality. (Genise Affd. ¶17 , Markyvech Affd. ¶14, Dresden Affd. ¶10).

20. The road trip of August 29-31, 1994 was considered successful by Genise, Dresden and Markyvech as the AutoSplit transmission system performed well throughout the testing, including successfully operating in the torque control mode and in the speed control mode, during various shift sequences. (Genise Affd. ¶17, Markyvech Affd. ¶14, Dresden Affd. ¶10). The results were reported in a Technical Report on February 21, 1995 which is discussed in connection with Exhibit 21.

21. During the development of the AutoSplit transmission system, Thomas Genise and Ron Markyvech periodically gave technical presentations to engineers at the Transmission Division of Eaton's Truck Components Operations North America (TCONA)

regarding the development and operation of the AutoSplit transmission system. (Genise Affd. ¶18, Markyvech Affd. ¶15). These presentations often included a detailed discussion of the software code. (Genise Affd. ¶18, Markyvech Affd. ¶15). On September 29, 1994, Ron Markyvech went to TCONA in Galesburg, Michigan to give such a presentation. Exhibit 13 is a copy of an Expense Report dated September 30, 1994, that Ron Markyvech submitted in connection with the September 29, 1994 trip and presentation. The "Purpose of Trip" section of this Expense Report includes the statement: "Project #5956-01 went TCONA for software code walk through and technical presentation on the AutoSplit concept." (Markyvech Affd. ¶15).

22. The AutoSplit transmission prototype was subsequently demonstrated to engineers of Eaton's TCONA on January 11, 1995. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). Tom Genise and Ron Markyvech performed the demonstration. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶5, Steeby Affd. ¶5). The Eaton TCONA engineers that attended the demonstration included John Steeby and Warren Dedow, and the structure and operation of AutoSplit were understood by Steeby and Dedow. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶6, Steeby Affd. ¶6). Exhibit

14 is a partial printout of Ron Markyvech's 1995 Personal log. The entry for January 11, 1995, indicates that Markyvech went to Marshall, Michigan and demonstrated the AutoSplit transmission system implemented in the Freightliner truck. During the September 12, 1994 and the January 11, 1995 demonstrations, John Steeby and Warren Dedow each drove the truck. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7, Steeby Affd. ¶7). The AutoSplit transmission prototype performed well during these demonstrations, operating in the torque control mode and in the speed control mode during various shift sequences providing clutchless and throttleless shifting for the multi-speed transmission. (Genise Affd. ¶19, Markyvech Affd. ¶16, Dedow Affd. ¶7-9, Steeby Affd. ¶7-9).

23. The AutoSplit transmission system demonstrated on January 11, 1995 was basically the same system previously demonstrated on September 12, 1994 and tested during the road trip of August 29-31, 1994. (Genise Affd. ¶20, Markyvech Affd. ¶17). One difference between the systems concerned the shift display. In the system demonstrated on September 12, 1994 and tested between August 29-31, 1994, the top portion of the shift lever contained a display for displaying the currently engaged gear and the next gear (Genise Affd. ¶20, Markyvech Affd. ¶17; Exhibit 9). In the system demonstrated on January 11, 1995, the display was re-configured as a separate device mounted on the

truck's console. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 15 is a photocopy of the actual display used at the January 11, 1995 demonstration.

24. Another difference between the two systems concerned the shift lever. In the system demonstrated on September 12, 1994 and tested during August 29-31, 1994 trip, the driver intent-to-shift switch was not placed on the shift lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). During the August 29-31, 1994 trip, the intent-to-shift switch was the PC. The PC was connected to the system's communication data link and the intent-to-shift command was inputted by depressing keys on the keyboard of the PC. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). In the AutoSplit system demonstrated on January 11, 1995, a new shift lever was implemented which included an intent-to-shift switch or button on the lever. (Genise Affd. ¶20, Markyvech Affd. ¶17, Dresden Affd. ¶11). Exhibit 16 is a photocopy of the actual shift lever with the intent-to-shift button used during the January 11, 1995 demonstration. The intent to shift button was added to the shift lever on November 10, 1994 as indicated by the entry for this date in Ron Markyvech's log (Exhibit 17) .

25. There was also a modification to the software that was demonstrated on January 11, 1995. Exhibit 18 is a copy of the software code implemented in the transmission ECU demonstrated on

January 11, 1995. According to this code, function sequence_shift will call function shift_initiate which will set engine_commands to ENGINE_PREDIP which then calls function control_engine_predip to control automatically the engine torque parameter to zero as a function of predicted zero torque. (Genise Affd. ¶21, Markyvech Affd. ¶18).

26. A further demonstration of the Freightliner truck including the AutoShift system occurred on July 14, 1996 at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Thomas Genise described and demonstrated the AutoSplit transmission system on July 14, 1995 to engineers and upper management of Eaton Corporation. (Genise Affd. ¶23, Steeby Affd. ¶5, Edelen Affd. ¶6). Exhibit 19 is a Travel Expense Report that Genise submitted on July 17, 1995 for the travel he conducted the week of July 10, 1995. This travel included the July 14, 1995 demonstration trip. The "Purpose of Trip" section of the Report indicates that on July 14, 1995, Genise demonstrated the AutoSplit to TCONA management. Exhibit 19 also includes the Travel Expense Report of Ron Markyvech which indicates that he took the AutoSplit Concept Truck for the Automation Planning Meeting.

27. The AutoSplit transmission system demonstrated on July 14, 1995, included the same hardware components and operated according to the same software structure described above in

connection with the AutoSplit transmission system demonstrated on January 11, 1995. (Genise Affd. ¶23). The AutoSplit transmission system worked well during the demonstration performing clutchless and throttleless shifts and operating in the torque control mode and speed control mode during various shift sequences. Exhibit 20 is a memo from William A. Baken dated July 17, 1995 setting forth the "Automation Strategic Planning Meeting Minutes" for the July 14, 1995 meeting/demonstration. The third page of the memo indicates that Thomas Genise demonstrated the AutoSplit Concept Truck. Attached to the memo there is a copy of the Agenda for the July 14, 1995 meeting/demonstration. The Agenda indicates that ride and drive demonstrations were available at 7:00 am and 1:00 pm on July 14, 1995.

28. On February 21, 1995, Thomas Genise prepared a Technical Report regarding the AutoSplit Transmission prototype. (Genise Affd. ¶22). Exhibit 21 is a copy of the February 21, 1995 Technical Report which includes descriptions of the various control algorithms, and also provides plotted data of system parameters taken during actual vehicle shift testing.

29. Fig. 1 on page 5 of Exhibit 21 shows a block diagram of the AutoSplit system which includes a multi-speed transmission, an engine, an engine controller ECU2 connected to the engine via a J1939 communication data link, and a driver display for displaying the presently engaged gear, and a possible or

desirable upshifted/downshifted gear.

30. The "intent-to-shift" button - described on page 2 of Exhibit 21 - is located on the side of the shift lever and is operated by the driver's thumb. Exhibit 21 describes the software variable for zero driveline torque: needed_percent_for_zero_flywheel_trq. (Exhibit 21, ps. 13-14). This variable is requested via the engine communication data link J1939 by the engine controller (Exhibit 21, p. 12).

31. The AutoSplit Technical Report was signed and approved by Eugene Braun, and was widely distributed throughout Eaton Corporation. The individuals receiving the AutoSplit Technical Report included Ron Markyvech, Jon Steeby, Warren Dedow, Steve Edelen and Marcel Amsallen (Exhibit 21, cover page).

32. As indicated, during the period of time from the beginning of July 1995 through the end of June 1996, the automated transmission program of Eaton Corporation included related projects under the names "AutoShift", "AutoSplit" and "Top Two". During this time period, continuous efforts were made to develop these related projects so as to provide commercially viable transmission systems. (Genise Affd. ¶24 , Markyvech Affd. ¶19).

33. These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the

operator to utilize the clutch and/or throttle pedal, thereby assisting the driver with the shift sequence. Further, these projects had essentially the same or similar software structure for purposes of automating and/or assisting a transmission shift sequence. For example, each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral from a gear to be disengaged, and to achieve engine synchronization speed for clutchless engaging a target gear ratio. (Genise Affd. ¶24, Markyvech Affd. ¶19).

34. During the period of time from the beginning of July 1995 through the end of June 1996, Thomas Genise, along with Ron Markyvech under Genise's supervision continuously worked on developing products for heavy duty trucks in Eaton's automated transmission program. (Genise Affd. ¶24-30, Markyvech Affd. ¶19).

35. Exhibit 22 includes the time sheets for Ron Markyvech, Tom Genise and John Dresden III between July 1995 and June 1996. As indicated in the table below, the majority of Genise's and Markyvech's time, for each month between July 1995 and June 1996, was spent on developing products for the AutoShift/AutoSplit/Top-Two automated transmission projects.

Ron Markyvech	
July '95	83.5 hours
August '95	109.5 hours
Sept. '95	133.0 hours
Oct. '95	169.0 hours
Nov. '95	137.0 hours
Dec. '95	83.5 hours
Jan. '96	101.5 hours
Feb. '96	90.0 hours
Mar. '96	121.0 hours
Apr. '96	121.0 hours
May '96	131.5 hours
June '96	81.0 hours
Total	1,361.5 hours

Tom Genise	
July '95	111.0 hours
Aug. '95	108.5 hours
Sept. '95	111.0 hours
Oct. '95	159.5 hours
Nov. '95	162.5 hours
Dec. '95	121.0 hours
Jan. '96	172.5 hours
Feb. '96	135.5 hours
Mar. '96	119.0 hours
Apr. '96	95.5 hours
May '96	80.5 hours
June '96	110.5 hours
Total	1,487 hours

36. Exhibit 23 includes Markyvech's personal logs for 1995 and 1996. These logs detail his work activity on a daily basis for 1995 and 1996. Exhibit 24 is a collection of Genise's monthly reports for the period between July 1995 and June 1996 as well as the Genise's Travel Expense Reports during this period. Below is a summary of Genise's and Markyvech's product development activities between July 1995 and June 1996 relating to Eaton's AutoSplit/AutoShift/Top Two automated transmission

projects.

37. In July 1995, Tom Genise and Ron Markyvech worked on the AutoShift and AutoSplit automated transmission projects. On July 12, 1995, Tom Genise travelled to Galesburg, Michigan to attend a J1939 data communication link meeting. Markyvech's personal log (Exhibit 23) and July 1995 Monthly Report indicate that towards the end of July, Markyvech worked on the transmission manager code for the AutoShift 7-speed transmission project.

38. Throughout August 1995, Markyvech worked on development of the 7 speed AutoShift project. This work included identifying a problem with the reverse gear switch. Specifically, on August 28, 1995, Markyvech uncovered that the reverse gear switch would give a mismatch when trying to engage low gear. This mismatch problem was caused because software function "x_outside_offset" was too small. On August 22, 1995, Genise prepared a Functional Performance Specification for the AutoSplit project (Exhibit 25). On August 30, 1995, Genise distributed an AutoSplit Design Specification sheet (Exhibit 26). Exhibit states that "TACONA has identified the AutoSplit transmission concept as an integral part of their automatic product strategy".

39. On September 29, 1995, Genise travelled to Galesburg, Michigan to attend an automation team meeting. On September 30, 1995, Genise prepared Revision 1.0 of the AutoSplit Product

Design Specification (Exhibit 27). In September 1995, Markyvech worked on the AutoSplit and AutoShift transmission projects. On September 11, 1995, Markyvech stripped the AutoSplit wire harness out of a test vehicle for use in the 7 speed AutoShift test vehicle. Much of the remainder of the month was spent installing and testing the vehicle interface wiring. Markyvech's September 1995 Report for the 7 speed AutoShift details the accomplishments for the month including modification of the base AutoShift software, testing the Freightliner vehicle wire harness, modifying the four rail shift bar housing, installing the transmission in a truck, and starting initial system debugging.

40. In October 1995, Markyvech spent most of his time working on the 7 speed AutoShift vehicle software. Markyvech's October 1995 Report for the 7 Speed Autoshift details the accomplishments for the month which includes modifying the software to account for the varying step sizes of the seven speed transmission, and modifying the software to include the capability of adjusting the upshift point based on the target gear. On October 12, 1995, Genise travelled to Milford, Michigan to grade test the AutoShift transmission system. On October 30, 1995, Genise prepared a Design Specification (Exhibit 28) which indicates that revisions to the AutoSplit development will be continued under another project. Genise also prepared on October 30, 1995, a revised AutoSplit Design Specification (Genise Affd.

¶24; Exhibit 29).

41. Between November 1-3, 1995, Genise travelled through northern Michigan test driving the AutoShift transmission system. On November 17, 1995, Genise prepared a revised Functional Performance Specification for the AutoSplit project (Exhibit 30). On November 13 and 28, 1995, Genise travelled to Galesburg and Southfield, respectively, test driving the AutoShift transmission. On November 22, 1995, Genise traveled to Traverse City, Michigan, test driving the 7 speed AutoShift system. In November 1995, Markyvech continued work on the 7 speed Autoshift project. On November 21, 1995, Markyvech wrote a miles/hour - function MI_PER_HOUR - reading software routine for the AutoShift, and bench tested the routine. On November 28, 1995, Markyvech tested the AutoShift truck to obtain acceleration data. Markyvech's November 1995 Report for the Autoshift 7-Speed Prototype indicates the accomplishments for the month as including testing the vehicle, and demonstrating the vehicle on November 11, 1995. In November Markyvech also started work on the Top Two project. On November 13, 1995, Markyvech went to Galesburg, Michigan to pick up the Top Two truck that was to be used for evaluation purposes.

42. On December 5, 1995, Genise travelled to Marshall, Michigan test driving the Top 2 truck. On December 20, 1995, Genise travelled to Galesburg, Michigan, for a demonstration of

the AutoShift transmission system. In December 1995, Markyvech started working on the performance code for the 10 speed AutoShift. On December 11, 1995, Markyvech tested the performance code for the 10 speed AutoShift. On December 21, 1995, Markyvech tested the 10 speed Autoshift in different performance modes of operation. Markyvech's December 1995 Report indicates that the accomplishments for the month included installing and testing various software code for allowing the engine to upshift at higher engine RPMs, for adding an additional 400 RPMs to the deceleration rate of the engine during upshifts, for allowing double upshifts, and for using the engine compressing brake when doing skip shifting.

43. Genise and Markyvech spent much of January 1996 developing a skip shiftability function for the AutoShift transmission system. On January 31, 1996, the skip shiftability feature was demonstrated to Marcel Amsallen of Eaton Corporations' Truck Component Operation North Americas (TCONA) in Galesburg, Michigan. On January 16, 1996, Genise travelled to Milford, Michigan, test driving the AutoShift. On January 31, 1996, Genise travelled to Galesburg, Michigan to demonstrate the AutoShift software and to meet with TCONA people. Genise's January 1996 Monthly Report states that during this month, the AutoShift Shift algorithm was modified to include skip shifting, and was made more adaptive to actual engine braking

effectiveness. Markyvech also attended a meeting on January 11 at TCONA in connection with the Top-Two project. Markyvech's January 1996 Report indicates that the skip shift algorithms were developed, and that an adaptive algorithm that monitors the turn off delay of the engine compression brake used on skip upshifts was incorporated into the software.

44. Genise's February 1996 Monthly Report indicates that on February 7, 1996, the modified AutoShift software that included skip shifting was demonstrated. Further, during this month, a task was added to evaluate a modified pneumatic inertia brake used to speed up shifting, and test software was written that allows the AutoShift truck to be used as the stationary test stand. On February 27, 1996, Genise travelled to Calamus, Michigan to attend a Top 2 team product development meeting. In February, 1996, Markyvech worked on the Top 2 project which was implemented in a Mack truck. Markyvech also continued work on the AutoShift project. On February 15, 1996, Markyvech worked on getting his laptop computer to run the ENG2 diagnostic software. On February 26, 1996, Markyvech worked on AutoShift truck-as-test-stand code. Markyvech's February 1996 AutoShift Support Report indicates that test software was written that allows the AutoShift truck to be used as a stationary test stand. Markyvech's February 1996 Report entitled "Top Two Continued Support" indicates that accomplishments for February 1996

included receiving software and hardware packages for testing and evaluation, and implementing engine controller ENG2 diagnostic software on a desk top PC.

45. Genise's March 1996 Monthly Report - which mistakenly states that it is for the month of February - indicates that on March 26, 1996, a meeting was held to discuss a method of routing pressurized oil from the transmission internal oil pump. The Report also indicates that during March 1996, software regarding the SEL_GEAR module was written, incorporated into the Mack system and tested. Genise's March 1996 report entitled "AutoShift Support" also mentions the oil routing method for the AutoShift transmission. On March 29, 1996, Genise travelled to Dearborn, Michigan to obtain hardware for the Volvo AutoSplit Truck. Much of Genise's work in March 1996 was spent working on software for the Top Two project. This included work on the select gear module SEL_GEAR on March 14, 15 and 21. Markyvech's March 1996 Report entitled "Mack Top Two Concept Prototype" indicates that the accomplishments for March 1996 included writing and incorporating the SEL_GEAR module. Further, a competitive comparison was prepared for the Mack system versus the AutoShift system. In addition, at the end of March Markyvech worked on the AutoSplit project. Specifically, on March 28-30, Markyvech worked on installing a wiring harness for an AutoSplit system in a test vehicle.

46. Genise's April 1996 Report indicates that during this month an AutoSplit system was installed in a Volvo truck. Genise's April 1996 Report entitled AutoShift Support indicates that a new test was prepared that uses the integral oil pump in the transmission. In the beginning of April 1996, Markyvech worked on installing the AutoSplit wiring harness. On April 22, Markyvech worked on the torque transducer software/calibration. Markyvech also worked on the Mack Top Two towards the end of April. Markyvech's April 1996 Report entitled MACK TOP TWO CONCEPT PROTOTYPE indicates that during April 1996 software coding efforts continued. Markyvech's April 1996 Report entitled "Volvo AutoSplit Retrofit" indicates that the AutoSplit system was installed in a new Volvo vehicle that was supplied to TCONA, and that repairs were made to the wiring harness during the installation.

47. Genise's May 1996 Monthly Report indicates that approximately 80 percent of the software code needed for the Mack Top Two has been designed, written, compiled and integrated into the bench top system. On May 16, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. On May 22, 1996, Genise made a trip to Mack Truck, Inc. to discuss the Top 2 project. On May 15, Genise prepared a document entitled "Volvo AutoSplit RetroFit" (exhibit). The purpose of this document was to document the efforts on installing the AutoSplit transmission

system in a vehicle for demonstration and evaluation purposes. On May 28, 1996, Genise travelled to Galesburg, Michigan to discuss the AutoShift project. Further, Genise's May 1996 Report entitled "AutoShift Support" indicates that during this month plans were being made with TCONA to continue testing and development of 25 AutoShift units. Markyvech spent most of his time in May 1996 working on the Mack Top Two. On May 8, 1996, Markyvech performed tests regarding output shaft speed acceleration. On May 14, Markyvech worked on debugging the skid detection routine. Towards the end of May, Markyvech worked on getting the Mack Top Two to shift automatically on the bench. Markyvech's May 1996 Report entitled "Mack Top Two Concept Prototype" indicates that work continued on the software code, and by May 1996 approximately 4.4K bytes of code had been written. Further, the Report indicates work on testing and debugging of the Top Two software modules.

48. Genise's June 1996 Monthly Report indicates that development on the AutoShift system continued. On June 13, 1996, Markyvech travelled to Southfield, Michigan to obtain supplies for the AutoSplit installation. On June 18, 1996, Genise travelled to Warren, Michigan, in connection with the AutoSplit truck. On July 1, 1996, Genise travelled to Marshall proving grounds for an AutoSplit demonstration. In the beginning of June 1996, Markyvech worked on getting the Mack Top Two to shift

automatically on the bench. On June 10, Markyvech worked on the resync portion of the Mack Top Two software code. Markyvech's June 1996 Report entitled "Mack Top Two Concept Prototype" indicates that initial software was approximately 90 percent complete. During the last two weeks of June, Markyvech worked on installing the AutoSplit in a new vehicle for purposes of testing and evaluation. Markyvech's June 1996 Report entitled "AutoSplit Continued Development" also discusses the AutoSplit transmission installation.

X. DISCUSSION

A. Genise Is Entitled To Priority Based On (1) Actual Reduction To Practice Prior To The Filing Date of the Palmeri et al '588 Patent And (2) Conception Plus Diligence To Constructive Reduction To Practice

1. Law Of Actual Reduction To Practice

In order to demonstrate an actual reduction to practice for purposes of showing priority in an interference, the device or process must include every essential limitation of the count. Correge v. Murphy, 217 USPQ 753 (Fed. Cir. 1983). Further, the reduction to practice must show the practical usefulness of the invention. Symmes v. King 21 USPQ 2d 1462 (Fed. Cir. 1991).

In the present case there were multiple reductions to practice of the invention. Specifically, reduction to practices occurred in August 1994, January 1995 and July 1995.

Applicant is submitting herewith the Affidavits of Thomas A. Genise, Ronald K. Markyvech and John Dresden III. These

individuals developed, built and tested the AutoSplit automated transmission system. (Genise Affd. ¶11-12, Markyvech Affd. ¶5-8, Dresden Affd. ¶5-7). These Affidavits together with the attached documentary evidence establish that the AutoSplit transmission system was implemented in a Freightliner truck having a ten speed transmission, and that the Freightliner truck having the ten speed AutoSplit transmission successfully completed a three day road test between August 29-31, 1994. (Genise Affd. ¶13, Markyvech Affd. ¶8, Dresden Affd. ¶6). Further, these Affidavits establish that the Freightliner truck having the AutoSplit transmission was successfully demonstrated on January 11, 1995 and July 14, 1995 to engineers of Eaton Corporation's Corporate Research & Development-Detroit Center and of Eaton's Transmission Division. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These demonstrations occurred at Eaton's proving grounds in Marshall, Michigan. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18).

Applicant is also submitting the Affidavits and attendant documentary evidence of Jon Steeby, Steven Edelen and Warren Dedow. Steeby, Edelen and Dedow were all familiar with the AutoSplit transmission hardware and software. (Edelen ¶7-8, Dedow Affd. ¶6). Steeby and Dedow attended the demonstration on January 11, 1995 during which they drove the Freightliner truck containing the AutoSplit transmission system. (Steeby Affd. ¶7, Dedow Affd. ¶7). Edelen and Steeby attended the demonstration on

July 14, 1995. (Edelen Affd. ¶8 and Steeby Affd. ¶5).

The affidavits and accompanying documents submitted herewith demonstrate that the AutoSplit transmission system was an operable working transmission system on August 29-31, 1994 on January 11, 1995, and on July 14, 1995 - all of which are prior to the July 27, 1995 filing date of the Desautels et al '477 patent. These Affidavits and accompanying documents also establish that the AutoSplit transmission system prototype included every limitation recited in the proposed Counts 1 and 2.

Specifically, the Affidavits and documentary evidence establish that the Freightliner truck with the 10 speed AutoSplit transmission demonstrated on August 29-31, 1994, on January 11, 1995, and on July 27, 1995 each contained: an engine having an output shaft; a multi-speed transmission connected to the engine output shaft; an engine control to control engine fueling of the engine; and an operator input for allowing the operator to signal a desire to eliminate torque between the engine and the transmission (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-8, Edelen Affd. ¶8-11, Dedow Affd. ¶7-8). The evidence also indicates that the engine control determined a zero torque fuel parameter value for the engine that approximated a zero torque load on the connection between the engine and the transmission; that the engine control operated to control the engine fueling to achieve the zero torque parameter value; and

that after the zero torque fuel parameter value was obtained, the transmission was manually moved out of engagement to a neutral position (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18, Steeby Affd. ¶7-9, Edelen Affd. ¶8-13, Dedow Affd. ¶7-9). Specifically, the software program of Exhibit 12 includes module "drl_cmds.c96" which contains the function "determine_shiftability_variable" and the function "needed_percent_for_zero_flywheel_trq". (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). These functions serve to predict a zero flywheel torque based on system variables. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The function "control_intent_to_shift" and the function "intent_final_pct_trq" which are also contained in module drl_cmds.c96 serve to modify engine speed such that a zero torque condition exists. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). In particular, the function intent_final_pct_trq serves to ramp the torque down to the zero torque value. (Genise Affd. ¶13-23, Markyvech Affd. ¶8-18). The transmission ECU included software routines for determining the currently engaged gear and the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, based on information from the input and output shaft speed sensors, the function determine_gear from module trans_act.C96 determined the currently engaged gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear from module sel_gear.c96 determined whether an upshift or a downshift is to be expected as the next

shift and calculated the speed ratio at the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13). The function get_automatic_gear determined whether an upshift or downshift is to be expected based on such operating conditions as upshift/downshift points, transmission input speed, output shaft speed and acceleration pedal position. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The transmission ECU further included a software routine for determining a synchronization speed for the engine based on the next expected gear ratio and the transmission output speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, within module drl.cmds.c96, the function control_engine_sync was used to control the engine synchronization speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Further, in order to determine the sync speed for the next gear, the function desired_engine_speed was set equal to (int)(gos_signed + sync-offset), where gos = (next gear x transmission output shaft speed). (Genise Affd. ¶16, Markyvech Affd. ¶13). In order to ensure that the synchronization speed was obtained, the software controlled the engine speed to vary or toggle above and below the true sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). This ensured that the engine speed would periodically cross the actual sync. speed. (Genise Affd. ¶16, Markyvech Affd. ¶13). Specifically, in the module drl_cmds.c96, the function control_engine_sync and the if

statement "toggle" varied the engine speed above and below the true sync. speed every two seconds. (Genise Affd. ¶16, Markyvech Affd. ¶13). Once the synchronization speed was obtained, the operator could manually shift the transmission towards the next expected gear. (Genise Affd. ¶16, Markyvech Affd. ¶13).

The evidence demonstrating the reduction to practice of the AutoSplit is summarized below in table form.

Count 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
A method of controlling the operation of a vehicle comprising the steps of:	The AutoSplit transmission system provided a method of controlling the operatio of a vehicle.

Count 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Exhibit 7 shows an engine having an output shaft. Exhibit 6 shows the engine control which controls the output speed of the engine output shaft (Genise Affd. ¶ 10, Markyvech Affd. ¶13). Exhibit 5 shows a multi-speed (ten) selectively connected to the engine output shaft and operable to convert drive from the engine output shaft through several speed ratios. Exhibit 10 shows the master clutch foot pedal which selectively activates the clutch positioned between the engine and the transmission. Based on information from input and output shaft speed sensors, function determine_gear (Exhibit 12) determines the currently engaged gear, function get_automatic_gear determined the next expected gear, and function desired_engine_speed was used to determine the sync. speed based on the next gear multiplied by transmission output shaft (g x os).
(b) operating a vehicle using the system provided in step (a);	The AutoSplit transmission system operated the vehicle using the system provided in step (a).
(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	Functions determine_gear and get_automatic_gear (Exhibit 12) determine the current gear and whether upshift or downshift is next expected based on operating conditions.

Count 1	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	Based on the current gear and on receiving the intent-to-shift signal get_automatic_gear determined the next expected gear (Exhibit 12).
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	Function determine_gear determined when the transmission moved to neutral (Exhibit 12), function control_engine_sync was used to control the engine sync. speed, and function desired_engine_speed was set equal to the next gear times the transmission output speed G x Os to calculate the sync. speed of the next gear.
(f) varying said engine output speed above and below said synchronization speed such that said engine output speed periodically crosses an actual required synchronization speed for said transmission; and	The function control_engine_speed and the if statement "toggle" varied the engine speed above and below true sync. speed so engine speed would cross actual sync. speed every two seconds (Exhibit 12).
(g) manually shifting said multi-speed transmission towards said next expected gear.	Once the sync. speed was achieved, the operator could manually shift towards the the next gear (Markyvech Affd. ¶ 10, Genise Affd. ¶ 13).

Count 2	**AutoSplit Truck Transmission Concept Prototype (Reduction To Practice)**

A method of controlling the operation of a vehicle comprising the steps of:	The AutoSplit transmission system provided a method of controlling a vehicle operation.
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Exhibit 7 shows an engine having an output shaft. Exhibit 6 shows the engine control which controls the output speed of the engine output shaft (Genise Affd. ¶ 13-17, Markyvech Affd. ¶ 10-14). Exhibit 5 shows a multi-speed (ten) selectively connected to the engine output shaft and operable to convert drive from the engine output shaft through several speed ratios. Exhibit 10 shows the master clutch foot pedal which selectively activates the clutch positioned between the engine and the transmission. Based on information from input and output shaft speed sensors, function determine_ gear (Exhibit 12) determines the currently engaged gear, function get_automatic_gear determined the next expected gear, and function desired_ engine_speed was used to determine the sync. speed based on the next gear multiplied by transmission output shaft (g x os).
(b) operating a vehicle using the system provided in step (a);	The AutoSplit transmission system operated the vehicle using the system of step (a).

(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	Functions determine_gear and get_automatic_gear (Exhibit 12) determine the current gear and whether upshift or downshift is next expected based on operating conditions.
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	Based on the current gear and on receiving the intent-to-shift signal get_automatic_ gear determined the next expected gear (Exhibit 12).
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	Function determine_gear determined when the transmission moved to neutral (Exhibit 12), function control_engine_sync was used to control the engine sync. speed, and function desired_ engine_speed was set equal to the next gear times the transmission output speed G x Os to calculate the sync. speed of the next gear.
(f) adding an offset to said synchronization speed, and begin varying said engine output speed to approach said synchronization speed, with said offset; and	To determine sync. speed for the next gear, desired_engine_ speed (Exhibit 12) was set equal to (int)(gos_signed + sync_offset).
(g) manually shifting said multi-speed transmission towards said next expected gear.	Once the sync. speed was achieved, the operator could manually shift towards the the next gear (Markyvech Affd. ¶ 10, Genise Affd. ¶ 13).

The foregoing clearly establishes an actual reduction to practice of the invention defined in proposed Counts 1 and 2 on

August 29-31, 1994, on February 11, 1995 and on July 14, 1995.

2. <u>Conception</u>

As set forth in <u>Mergenthaler v. Scudder</u>, 11 App. D.C. 264, 1897 C.D. 724:

> The conception of the invention consists in the complete performance of the mental part of the inventive act. All that remains to be accomplished in order to perfect the act or instrument belongs to the department of construction, not invention. It is, therefore, the formation in the mind of the inventor of a definite and permanent idea of the complete and operative invention as it is thereafter to be applied in practice that constitutes an available conception within the meaning of the patent law.

See also, <u>Coleman v. Dines</u>, 224 USPQ 857 (Fed. Cir. 1985) and <u>Oka v. Youssefyeh</u>, 7 USPQ2d 1169 (Fed. Cir. 1988).

The facts of record indicate a conception of the invention in 1993. A written description of the invention in proposed Counts 1 and 2 are set forth in the Specification-type document (Exhibit A) Genise's presentation materials (Exhibit B), Genise's project proposal (Exhibit C), Genise's specification (Exhibit D), the software code printouts (Exhibits 12 and 18) and the Technical Report (Exhibit 21) - all of which are prior to July 27, 1995 - the filing date of the '558 patent. For purposes of simplifying the analysis of the Technical Report (Exhibit 21) entitled "AutoSplit truck Transmission Concept Prototype" dated February 21, 1995 will be compared relative to the elements/steps of proposed Counts 1 and 2 to demonstrate a conception prior to the '558 patent's filing date of July 27, 1995. This report was

approved by Eugene Braun, Genise's supervisor (Exhibit 21, cover page), and was widely distributed to numerous engineers and management personnel at Eaton Corporation (Exhibit 21; Genise Affd. ¶22). Set forth below is the comparison of the elements/steps of proposed Counts 1 and 2 and the February 21, 1995 Technical Report (Exhibit 21).

Count 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A method of controlling the operation of a vehicle comprising the steps of:	Exhibit 21 - Abstract describes a method of operating a vehicle.
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Exhibit 21 - page 5 shows a engine controller connected to an engine which inherently includes an output shaft via a J1939 data communication line, and a transmission. Page 7 describes the operation of a "conventional clutch" which is connected between the transmission and the engine. Pages 8-13 and Figs. 2-3 describe the speed control algorithms. page 14 describes the operation of the ECU for determining the currently engaged gear, and for determining a sync speed based on the determined speed ratio at the next expected gear and the transmission output speed (G * OS).
(b) operating a vehicle using the system provided in step (a);	Exhibit 21 - Abstract describes operating the vehicle in step (a).

Count 1	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	Exhibit 21 - Page 14 describes determining the currently engaged gear, and Figs. 2-3 show determining whether an upshift or a downshift is to be expected as the next shift based on operating conditions.
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	Exhibit 21 - Figs. 2-3 show determining a next expected gear based on the currently engaged gear and the expected shift.
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	Exhibit 21 - Page 4 describes the operating of receiving a signal that the transmission has been moved to neutral. Pages 8-13 and Figs. 2-3 describe the speed control algorithms. page 14 describes the operation of the ECU for determining the currently engaged gear, and for determining a sync speed based on the determined speed ratio at the next expected gear and the transmission output speed (G * OS). Page 6 describes controlling the engine speed to approach sync. speed.
(f) varying said engine output speed above and below said synchronization speed such that said engine output speed periodically crosses an actual required synchronization speed for said transmission; and	Exhibit 21 - Page 24 describes that in the sync mode, the engine is commanded to pass through sync speed and then back to an offset value below sync speed.
(g) manually shifting said multi-speed transmission towards said next expected gear.	Exhibit 21 - Page 6 describes the manually shifting of the multi-speed transmission by the driver to the next expected gear.

Count 2	**February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)**
A method of controlling the operation of a vehicle comprising the steps of:	Exhibit 21 - Abstract describes a method of controlling the operation of a vehicle.
(a) providing an engine having an output shaft, an electronic control unit for controlling the speed of said engine output shaft, said engine output shaft being connected to drive a multi-speed transmission through a clutch, and said electronic control unit being provided with information regarding a currently engaged gear in said transmission, and further to calculate the speed ratio at a next expected gear and determine a synchronization speed for the engine based upon the speed ratio at said next expected gear and the transmission output speed;	Exhibit 21 - page 5 shows a engine controller connected to an engine which inherently includes an output shaft via a J1939 data communication line, and a transmission. Page 7 describes the operation of a "conventional clutch" which is connected between the transmission and the engine. Pages 8-13 and Figs. 2-3 describe the speed control algorithms. Page 14 describes the operation of the ECU for determining the currently engaged gear, and for determining a sync speed based on the determined speed ratio at the next expected gear and the transmission output speed (G * OS).
(b) operating a vehicle using the system provided in step (a);	Exhibit 21 - Abstract describes operating a vehicle using the above system.
(c) determining the currently engaged gear and whether an upshift or a downshift is to be expected as the next shift based upon system operating conditions;	Exhibit 21 - Page 14 describes determining the currently engaged gear, and Figs. 2-3 show determining whether an upshift or a downshift is to be expected as the next shift based on operating conditions.

Count 2	February 21, 1995 Technical Report - "AutoSplit Truck Transmission Concept Prototype" (Exhibit 21)
(d) determining a next expected gear based upon said currently engaged gear and said expected shift of step (c);	Exhibit 21 - Figs. 2-3 show determining a next expected gear based on the currently engaged gear and the expected shift.
(e) receiving a signal that said transmission has been moved to neutral and identifying an engine synchronization speed by multiplying the speed ratio at said next expected gear with the current transmission output speed and beginning to control said output speed of said engine output shaft to approach said synchronization speed;	Exhibit 21 - Page 4 describes the operating of receiving a signal that the transmission has been moved to neutral. Pages 8-13 and Figs. 2-3 describe the speed control algorithms. page 14 describes the operation of the ECU for determining the currently engaged gear, and for determining a sync speed based on the determined speed ratio at the next expected gear and the transmission output speed (G * OS). Page 6 describes controlling the engine speed to approach sync. speed.
(f) adding an offset to said synchronization speed, and begin varying said engine output speed to approach said synchronization speed, with said offset; and	Exhibit 21 - Page 6 describes adding an offset value a fixed amount from sync speed.
(g) manually shifting said multi-speed transmission towards said next expected gear.	Exhibit 21 - Page 6 describes the manually shifting of the multi-speed transmission by the driver to the next expected gear.

As is apparent, Genise's February 21, 1995 Technical Report entitled "AutoSplit Truck Transmission Concept Prototype"

includes every feature set forth in proposed Counts 1 and 2, and therefore constitutes a complete conception of the invention.

3. Diligence

Diligence consists of activity directed toward reduction to practice of an invention or overcoming obstacles to reduction to practice. Diligence must be shown during the "critical period", i.e., from just before entry of the rival inventor into the field, to actual or constructive reduction to practice. Moller v. Harding, 214 USPQ 724 (Bd. Pat. Int. 1982). During the critical period there must be "reasonably continuous activity". Burns v. Curtis, 80 USPQ 587 (CCPA 1949).

In the present case the critical period begins just before July 27, 1995, the filing date of the Palmeri et al '558 patent. It ends with the constructive reduction to practice on June 19, 1996, the date the subject application was filed in the Patent Office. The facts of record show continuous diligence during this critical period.

During the period of time from the beginning of July 1995 through the end of June 1996, Eaton Corporation Corporate Research & Development Center in Detroit, Michigan (CORD-DC) had an automated transmission development program for heavy duty vehicles. (Genise Affd. ¶24, Markyvech Affd. ¶19). Eaton's automated transmission program included related projects under the names "AutoShift","AutoSplit" and "Top Two". (Genise Affd.

¶24, Markyvech Affd. ¶19). These projects were all transmission systems utilizing dynamic clutchless shifting wherein mechanical transmissions could be shifted using engine controls without requiring the operator to utilize the clutch and/or throttle pedal (Genise Affd. ¶24, Markyvech Affd. ¶19). Each of these projects included software for automatically controlling the engine fueling to achieve zero flywheel torque for clutchless shifting into neutral. (Genise Affd. ¶24, Markyvech Affd. ¶19).

In the present case, the record shows that Genise and Markyvech - under the supervision of Genise - continuously worked during the critical period on implementing the invention defined by proposed Counts 1 and 2 in a heavy duty truck driveline. Besides supervising Markyvech in connection with the transmission automation projects, Genise designed the system and software requirements including algorithm design, and determined system requirements. (Genise Affd. ¶24-30). In addition, Genise prepared specification requirements, project/program plans, and technical reports in connection with the automated transmission program. (Genise Affd. ¶24-30). Markyvech's work concentrated primarily on software development and testing. (Markyvech Affd. ¶4 and 19). However, Markyvech also developed and tested the electrical system needed for communicating between the engine Electronic Control Unit (ECU), the transmission ECU and the various system sensors, including the input and output shaft speed sensors.

(Markyvech Affd. ¶4 and 19). Markyvech also tested the J1939 data communication link between the engine and transmission ECUs. (Markyvech Affd. ¶4 and 19). Further, the record shows that John Dresden III, under the supervision of both Genise and Markyvech built transmissions, assembled prototypes from stock transmissions, built and installed electrical and mechanical transmission components, such as hoses, sensors, brackets, ECUs, and tested transmissions including recording and obtaining data. (Dresden Affd. ¶4-5). The time records for Genise, Markyvech and Dresden show continuous work on developing the AutoSplit/AutoShift/Top Two transmission systems (Exhibit 22):

Cumulative Time For Genise, Markyvech and Dresden Between July 1995-June 1996	
July '95	194.5 hours
Aug. '95	285.5 hours
Sept. '95	329.0 hours
Oct. '95	375.0 hours
Nov. '95	364.5 hours
Dec. '95	233.5 hours
Jan. '96	286.5 hours
Feb. '96	261.5 hours
Mar. '96	284.5 hours
Apr. '96	258.0 hours
May '96	274.0 hours
June '96	219.5 hours
Total	3,366.0 hours

All of the above show continuous diligence with respect to developing a product implementing the present invention well before July 27, 1995, and continuing past June 19, 1996.

4. Corroboration

Corroboration consists of a rule of reason determination of whether the evidence as a whole supports the claimed invention. Berges v. Gottstein, 618 F.2d 771 (CCPA 1980). The purpose of

the corroboration requirement is to prevent fraud. <u>Velsicol Chemical Corp. v. Monsanto Co.</u>, 579 F.2d 1038 (7th Cir. 1978). Evidence corroborating priority may be documentary or oral. <u>Bell Telephone Laboratories v. Hughes Aircraft Co.</u>, 565 F.2d 654, 657 (3d Cir. 1977), <u>cert. denied</u> 435 U.S. 924 (1978). In determining whether evidence of an invention has been sufficiently corroborated, courts apply a rule of reason approach, performing a reasonable analysis of the total evidence. <u>Berges v. Gottstein</u>, 618 F.2d 771 (CCPA 1980). Corroboration therefore turns on the facts when viewed as a whole. Moreover, corroborative evidence need not consist of an actual witnessing of the reduction to practice -- circumstantial evidence alone can satisfy the corroboration requirement. <u>Id. at 776</u>.

In the present case, the reduction to practice of the invention between August 29-31, 1994 is corroborated by Dresden. The reductions to practice on January 11, 1995 is corroborated by Steeby and Dedow. The reduction to practice on July 14, 1995 is corroborated by Steeby and Edelen, as well as by the later document prepared by William Batten which provides the minutes of the July 14, 1995 transmission automation meeting. The August 1994 and January 1995 reduction to practice is also corroborated by documents including the February 21, 1995 Technical Report for the AutoSplit Truck Transmission which indicates that the AutoSplit transmission system was successfully tested and

demonstrated. (Exhibit 21).

Exhibit 21 provides a conception of the invention which is corroborated by the Affidavits of Dedow, Edelen and Steeby. Each of these individuals received a copy of Genise's February 21, 1995 Technical Report detailing the invention defined in Counts 1 and 2.

XI. CONCLUSION

The evidence of record proves prima facie that Genise is entitled to priority relative to the July 27, 1995 filing date of the Palmeri et al '558 patent based on :

(a) prior reduction to practices of the subject matter defined in proposed Counts 1 and 2 on August 29-31, 1994, January 11, 1995 and July 14, 1995; and

(b) prior conception plus diligence to the constructive reduction to practice date of June 19, 1996 (the filing date of the subject application).

Accordingly, the Examiner is respectfully requested to declare an interference between U.S. Patent No. 5,582,558 and the present application No. 08/666,164 pursuant to Applicant's Request under 37 CFR §1.607(a).

Respectfully submitted,

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Date: August 29, 1997